

MONERIS: Tracking down the nutrients

How do nutrients get into the surface waters and what are the significant factors involved? What can be done to improve the quality of the water even more?

The MONERIS model (Modelling Nutrient Emissions in River Systems) was developed at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in order to be able to quantify nutrient emissions from point sources and diffuse sources within river catchment areas or basins. It distinguishes between the following emission pathways: atmospheric deposition, erosion, surface run-off, tile drainages, groundwater, urban systems and point sources. The model takes various regional characteristics into account, such as the available water resources, properties of the soil, slopes, geology, population, sewerage systems and a list of wastewater treatment plants from numerous digital maps. Statistical information, which was processed via a geographic information system (GIS), was also taken into consideration.

Testing, working with and developing MONERIS

- ✓ MONERIS is a scientific tool which is freely available (open software under a GNU General Public Licence). The MONERIS software can be downloaded from the following website: www.moneris.igb-berlin.de
- ✓ The modular structure within MONERIS enables individual components of the model to be further developed, adapted to new issues and passed on to third parties.
- ✓ It is possible to store different versions of input data in the database in parallel, in order to test the sensitivity to the model's results or to be able to carry out calculations for scenarios.
- ✓ For more detailed information on the model and the source code, please feel free to contact the IGB. They will set up access to the development section for you.

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City, country, river:

Modelling and managing
nutrient flows in lakes and
rivers



Nutrients in lakes and rivers – the dosage makes all the difference

The uses to which the countryside is put frequently results in higher nutrient emissions (nitrogen and phosphorus) into rivers and lakes. This usually leads to excess growth of algae and other aquatic plants.



When these plants die, decomposition processes can cause lower oxygen levels in the water, which in turn can produce hostile conditions for the aquatic fauna. In lakes and rivers which are rich in nutrients, it can even result in massive growth of cyanobacteria. These release toxic compounds which may temporarily restrict the use of these water bodies for swimming or as a source

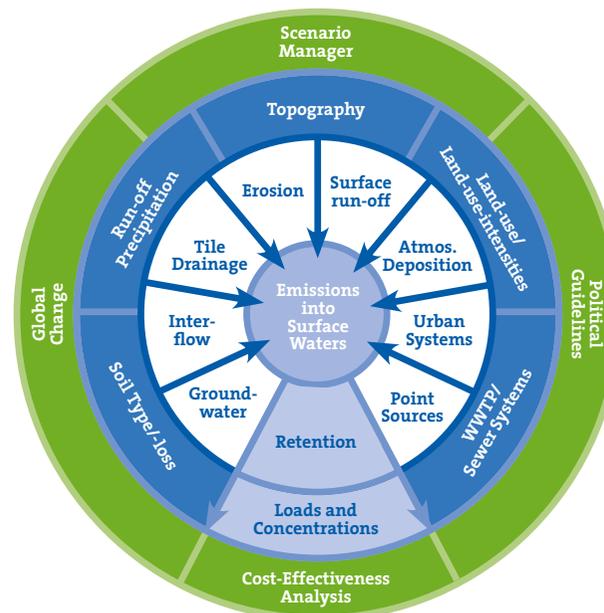
of drinking water. In order to maintain or improve the quality of our inland and coastal waters, and to safeguard important functions, the reduction of nutrient emissions and concentrations is imperative.

Where do the nutrients come from?

Nitrogen frequently results from excessive use of fertilisers in agriculture, along with deposition from the atmosphere. Important sources for phosphorous emissions are urban areas, specifically the discharge from wastewater treatment plants, industry, and the sewerage system. The natural geographic features of the catchment areas also affect both the quantity and the spatial and temporal distribution of nutrient emissions, as well as their effect on the water quality.



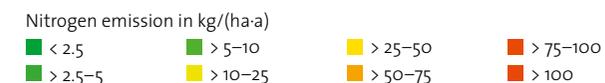
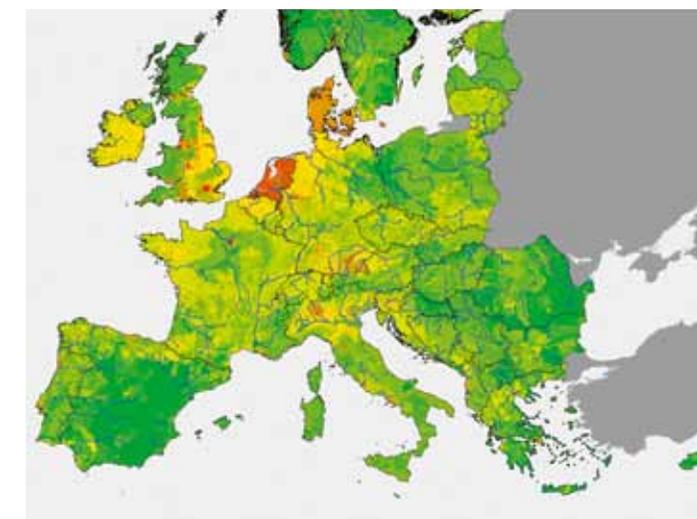
The MONERIS Structure



- External framework
- Catchment characteristics
- Pathways
- In-stream process

Harmonising data and methods

Using MONERIS enables researchers to produce a spatially differentiated model of monthly nutrient emissions and loads into a river system, right down to the sub-catchment area level. The results can then be presented as maps, diagrams and tables. MONERIS thus makes it possible to identify nutrient sources and emission pathways, to describe the transport and retention of nutrients in river systems, and to test and evaluate management options for the affected regions.



One challenge the IGB faces with MONERIS is that of harmonising methods, data and results across national boundaries and providing a uniform evaluation of water quality. Doing so aims to further close the gap between the integrated consideration of river systems and solving local problems.