Journal of Elementology ISSN 1644-2296

Hutorowicz, A., Napiórkowska-Krzebietke, A. and Zieliński, M. (2026) 'Indicators of water quantity and quality for monitoring, management and reducing diffuse pollution – a review', *Journal of Elementology*, 31(2), , available: https://doi.org/10.5601/jelem.2026.31.1.3749

RECEIVED: 12 March 2026
ACCEPTED: 2 May 2026

REVIEW PAPER

Indicators of water quantity and quality for monitoring, management and reducing diffuse pollution – a review*

Andrzej Hutorowicz[1], Agnieszka Napiórkowska-Krzebietke[2], Marek Zieliński[3]

[1] National Inland Fisheries Research Institute, Hydroacoustic Laboratory, Olsztyn, Poland
[2] National Inland Fisheries Research Institute, Department of Ichthyology, Hydrobiology and Aquatic Ecology, Olsztyn, Poland
[3] Institute of Agricultural and Food Economics – National Research Institute Department of Agricultural and Horticultural Economics, Warszawa, Poland

Abstract

The Water Framework Directive (WFD) focuses on ensuring good qualitative and quantitative health, i.e. on reducing and removing pollution and ensuring that there is enough water to support wildlife at the same time as human needs. It directly links to the EU Nitrates Directive, which aims also to protect waters (ground- and surface waters) from nitrate pollution by setting limits on agricultural nitrogen inputs. Therefore, the indicators used in water quantity and quality monitoring are necessary for sustainable water management and helpful in reduction of diffuse pollution. The study focused on reviewing the crucial indicators concerning water resources, water temperature and its pollution in Europe. The water balance shaped by geographic conditions result from climatic and hydrological processes. The water resources of rivers, lakes, and groundwater respond to precipitation, which determines the water supply and natural renewal. In agro-hydro systems, the amount of nitrogen released into the environment can be assessed based on the amount of macronutrients in natural fertilizers, and the size and structure of the livestock population. The ecological status/potential of surface waters expressed the criteria used to assess the quality of the structure and functioning of surface water ecosystems, which are influenced by pollution and habitat degradation. A large proportion of European surface waters failed to achieve at least good ecological status, i.e. 62% on average. Concerning chemical monitoring of waters, 68% of river water bodies had good chemical status, and 18% of lake water bodies had good chemical status. The European groundwaters are not as polluted as surface waters with good quantitative status (91%), and good chemical status (78% of groundwaters compared to 30% of surface waters).

Keywords: Nitrates, water resources, climate changes, temperature, ecological and chemical monitoring systems

Agnieszka Napiórkowska-Krzebietke, Prof. DSc., Department of Ichthyology, Hydrobiology and Aquatic Ecology, National Inland Fisheries Research Institute, Oczapowskiego street 10, 10-719 Olsztyn, Poland; e-mail: a.napiorkowska-krzebietke@infish.com.pl;

* This research was funded by Path4Med project, under the HORIZON programme (Project ID 101156867 within the framework of the HORIZON MISS 2023 OCEAN SOIL 01 01 topic funded by European Union