

## ABSTRACT

The European Union Water Framework Directive (WFD) requires a good chemical and ecological status of European surface waters by 2015. Integrated, risk-based management of river basins is presumed to be an appropriate approach to achieve that goal. The approach of focusing on distinct hazardous substances in surface waters together with investment in best available technology for treatment of industrial and domestic effluents was successful in significantly reducing excessive contamination of several European river basins. The use of the concept of chemical status in the WFD is based on this experience and focuses on chemicals for which there is a general agreement that they should be phased out. However, the chemical status, based primarily on a list of 33 priority substances and 8 priority hazardous substances, considers only a small portion of possible toxicants and does not address all causes of ecotoxicological stress in general. Recommendations for further development of this concept are 1) to focus on river basin-specific toxicants, 2) to regularly update priority lists with a focus on emerging toxicants, 3) to consider state-of-the-art mixture toxicity concepts and bioavailability to link chemical and ecological status, and 4) to add a short list of priority effects and to develop environmental quality standards for these effects. The ecological status reflected by ecological quality ratios is a leading principle of the WFD. While on the European scale the improvement of hydromorphological conditions and control of eutrophication are crucial to achieve a good ecological status, on a local and regional scale managers have to deal with multiple pressures. On this scale, toxic pollution may play an important role. Strategic research is necessary 1) to identify dominant pressures, 2) to predict multistressor effects, 3) to develop stressor- and type-specific metrics of pressures, and 4) to better understand the ecology of recovery. The concept of reference conditions to define the ecological status is hard to apply and tends to ignore the fact that ecosystems can be highly dynamic. A better understanding of ecosystem responses to changes as well as early warning systems and concepts sensitive to various stressors to discriminate disturbances from natural variation are required. Because ecosystems are closely interconnected, an integrated monitoring, diagnosis, and stressors-based management of the whole water, sediment, groundwater, soil, and air system is required considering land use and the interaction with a changing climate. Extending this holistic approach beyond a consideration of existing pressures by anticipating on future ones to use and protect the aquatic environment in a sustainable way is one of the big challenges.