



Costs of reducing phosphorus pollution in lakes

A recent study has assessed the costs and effectiveness of reducing phosphorus pollution for lakes in Scotland, UK, to achieve good ecological status as required by the EU's Water Framework Directive (WFD). It was found that phosphorus in 72% of the lake area in Scotland could be mitigated at a cost of £5.7 million (€7 million) per year, which is considered a proportionate or reasonable cost given the resulting social benefits.

Under the WFD¹, EU Member States are required to ensure all water bodies reach good ecological status (GES) by 2015. As part of the implementation process, the cost-effectiveness of different mitigation measures should be assessed so that the desired environmental benefits can be achieved at minimum cost to society. Where the costs of implementing mitigation measures are disproportionate to the social benefits received from achieving good ecological status, Member States are allowed to extend the 2015 deadline or to lower the environmental objectives to less strict criteria.

In Scotland, good ecological status has been defined for each lake type by the Scottish Environment Protection Agency. One of the measures that could improve water quality is to reduce the amount of phosphorus pollution entering the lakes. For this study, the researchers examined the costs, effectiveness and benefits of measures to mitigate phosphorus pollution from diffuse sources in support of achieving good ecological status for 544 Scottish lakes under the WFD at national and catchment levels. The costs of practical measures to reduce levels of phosphorus going into the lakes from agriculture, sewage treatment works and septic tanks were assessed for each lake and compared with the benefits of reaching good ecological status, i.e. clean water, at local lake level and national scales.

The study found that 293 of the lakes, which represent 31% of the total lake area, were already of good ecological status. If the practical measures to reduce phosphorus entering the lakes were implemented, a further 31% of lake area would achieve good ecological status at an annual cost of £2.09 million (€2.6 million). For the remainder of the lake area to reach good ecological status, there are methods to remove phosphorus directly from the lakes. Assuming the cost of this additional mitigation measure to be £200 (€250) per kilogram of phosphorus per year, the study estimated the total cost to be £189 million (€235 million) per year. A national scale ranking of lakes was then done, according to mitigation costs per unit lake area.

A valuation of WFD targets for Scottish lakes was used to estimate added benefits at national scale. When the costs of achieving good ecological status were compared with the benefits of lakes being of good ecological status at the national scale, it was found that 72% of the lake area could be mitigated at a reasonable, proportionate cost of £5.7 million (€7 million) per year, but the remaining 28% of the lake area could only be mitigated at a disproportionately expensive cost of £184.2 million (€230 million) per year. Using national average benefits resulting from the reduction of phosphorus in lakes with a scheme to estimate changes in the value of each individual lake according to the amount of phosphorus entering the lakes gave proportionate or reasonable mitigation costs of £25.6 million (€33 million) per year leading to and 77% of the lake area (491 lakes) achieving good ecological status.

These estimates have potential to inform subsequent debate about WFD disproportionality and affordability. Major sources of uncertainty include phosphorus export coefficients, benefits of GES for individual lakes and the costs for mitigation. Despite the uncertainty, the analysis suggests that there would be widespread benefit to Scottish society of supporting measures to encourage the mitigation of phosphorus pollution in vulnerable catchments. The WFD does not prescribe at what scale the disproportionality assessment has to be done, therefore Member States might take different approaches. There are arguments for different approaches (national, river basin, subcatchment and water body levels), and some of these are discussed in this paper.

1. See: http://ec.europa.eu/environment/water/water-framework/index_en.html

Source: Vinten, A.J.A., Martin-Ortega, J., Glenk, K. *et al.* (2012) Application of the WFD cost proportionality principle to diffuse pollution mitigation: A case study for Scottish Lochs. *Journal of Environmental Management*. 97: 28-37. Doi:10.1016/j.jenvman.2011.10.015.

Contact: andy.vinten@hutton.ac.uk, a.vinten@macaulay.ac.uk

Theme(s): Environmental economics, Water

The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)"; European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.