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Science for Environment Policy

Online tool enables quick comparison of strategies to control eutrophication

Researchers have developed an online tool to help water managers find effective ways of tackling eutrophication, an excess growth of weeds and algae that suffocates life in rivers, lakes and seas. They describe the tool as quick and easy to use and understand. Users can compare the likely effects of different strategies for cutting nutrient pollution in surface waters via an interactive map-based system; this is currently available for Sweden and Europe as a whole.

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Source: Strömbäck, L., Pers, C., Strömqvist, J., Lindström, G. and Gustavsson, J. (2018). A web based analysis and scenario tool for eutrophication of inland waters for Sweden and Europe. *Environmental Modelling & Software*. DOI: 10.1016/J.ENVSOFT.2018.07.012.

Contact:
lena.stromback@smhi.se

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There are many options for reducing phosphorus and nitrogen, the two nutrients responsible for eutrophication. However, it is challenging to compare the possible effects of these actions. Such comparisons require detailed information on how local conditions would affect each action, and how these actions would influence nutrient concentrations. There is a need, therefore, for more expert knowledge, modelling, and expensive computations.

To help overcome this problem, Swedish researchers have developed a new web-based tool to quickly estimate the effects of actions to reduce nutrient concentrations in surface water. It is currently available in two forms: a Europe-wide version (http://eutrophication.eu/), developed under the EU Switch-On[1] project, and a Swedish version (http://vattenweb.smhi.se/scenario/).

Users can click on a sub-basin of interest (the 'focus area') on a map to instantly display the net nutrient load from other upstream sub-basins. The tool also provides a graph and figures showing the source of nutrients for the focus area – the percentages derived from agriculture and industry, for example. Users are also able to see how these sources differ for each upstream sub-basin.

To explore the effects of different nutrient mitigation strategies, users adjust the nutrient load from individual sources (e.g. agriculture) depending on the expected effect of a strategy. The tool instantly shows the effect of this adjustment on overall nutrient levels in the focus area.

The tool was developed through close collaboration between hydrologists, IT experts, and end users. Data for the tool came from a hydrological model named HYdrological Predictions for the Environment (HYPE), which was first developed in Sweden as a basis for reporting water flow and quality data to the EU as part of the Water Framework Directive[2]. For the eutrophication tool, the researchers used two versions of HYPE: S-HYPE (for Sweden) and E-HYPE (for Europe). S-HYPE contains more data than E-HYPE, as it is based on local knowledge and not just open data, and so provides maps of higher resolution.

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1. Switch-on was supported by the European Commission under the Seventh Framework Programme: www.water-switch-on.eu
2. http://ec.europa.eu/environment/water/water-framework/index_en.html

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Online tool enables quick comparison of strategies to control eutrophication *(continued)*

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The researchers tested the tool on real-life situations in Sweden to gauge its usefulness. These tests indicated, for example, that upgrading waste-water treatment works would lead to a 3% reduction in nitrogen loads to a focus area, but that removing two waste-water treatment plants and diverting water to another catchment would reduce nitrogen loads in the same area by 6%. According to the researchers, these tests also indicated that, in most cases, the tool gives comparable results to more expensive simulation methods.

Users requested that that the tool should be quick to use and provide immediate results. This means that it is based on simplified computations, but the researchers state that it provides 'good enough approximations', suitable for giving a good first overview of plausible scenarios under present conditions. In many cases its use should be followed up with more detailed studies.