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New valuation of water-quality ecosystem services provides decision-making tool

Valuations of water quality as an ecosystem service often fail to include related services such as recreation or human health, and do not consider the effects of water quality changes due to management. Researchers have now developed a template for valuation that considers multiple services and links management actions to changes in water quality and ultimate economic value.

Quantifying the value of goods and services provided by nature enables decision makers to predict possible impacts of policies or actions. While good water quality is recognised as a vital ecosystem service, difficulties remain in estimating its true value. In this study, researchers identified three main challenges facing valuation of water-quality based ecosystem services, proposed a new template, and set guidelines for its use.

A first challenge is that valuation estimates are generally not linked with changes in water management practices. This is of particular significance for decision makers, since without this they are unable to fully compare the consequences of alternative practices and actions. Secondly, water-quality services are diverse and range from quality of drinking water to commercial fisheries or recreation. Although this results in added complexity, any valuation tool omitting these factors could severely underestimate the true service value, and neglect possible trade-offs.

Finally, economic and biophysical models are often not well integrated. For example, where a biophysical model may measure phosphorus concentrations, an economic model may include data on the amount of money the public are willing to pay for enjoyment of a clean lake, which cannot be easily and accurately related to the levels of phosphorus.

The new three-stage valuation framework proposed in this study can be applied to both inland water bodies such as lakes and streams but also coastal bays and ocean beachs, by using relevant data relating to different conditions and services. In the first stage, biophysical models link changes in management with the change in water quality, for example, in terms of pollutant concentrations. The second stage relates the change in water quality to the ultimate effects on ecosystem goods or services, such as the frequency of beach closures or the toxicity of algal blooms. The final stage translates the changes in such goods or services to changes in economic value.

At each stage, the researchers strongly recommend that the models take into account the interactions between changes in water quality and the multiple ecosystem services provided. For example, levels of phosphorus can influence both water clarity and abundance of fish and these factors in turn will affect the ultimate value of lake fishing, swimming and viewing nature.

For effective use of the framework, the researchers recommend that users first identify the beneficiaries of interest (e.g. commercial fishing companies and swimmers) and the valued attributes (e.g. high fish abundance and low water toxicity) and then ensure that the most appropriate biophysical and economic models are chosen. For example, a biophysical model specific to groundwater is needed to assess levels of nitrates in wells.

The study does highlight that extensive data, which may be difficult to obtain, are needed for their proposed framework. However, a key advantage of this approach is that it enables uncertainties, including estimates based on small amounts of data, to be identified and taken into account.

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