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Eutrophication and its Complex Effects on Freshwater Ecosystem Services

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Introduction

Flow changes, pollution, species extinctions, species invasions, temperature changes, global climate change and increases in UV radiation are all examples of anthropogenic influences on freshwaters. Given that people use a significant percentage of the world's freshwater supply, rely on freshwater resources for existence and are affecting water security throughout the world, a global perspective on effect is necessary [1].

One method to describe the current and future global impacts on freshwaters is to put them in the perspective of the ecological services that freshwaters give to humans. Such studies can identify a wide range of effects and intricate relationships among the factors impacting freshwater availability and ES supply rates across the world [2]. The linkages between the sources of ES change are typically complicated and managers must frequently assess the value of one ES over another.

Description

The many anthropogenic consequences on ES are exemplified by eutrophication. Nutrient addition can boost primary producers and fish output, but it can also reduce diversity and degrade water quality due to cyanobacteria blooms' taste, odour and toxicity issues. As a result, management may be compelled to determine how to balance the ES of fish output against the quality of water. Multiobjective management techniques can maximise benefits while reducing harm once such a framework is in place [3].

For several geographical and temporal scales, factors impacting ES have been found. The integration of ES into a wider framework, in which their relative rankings are provided, as well as how the components of the ES are connected to one another, is just getting started. The protection and management of water quality and quantity need cross-disciplinary collaboration and knowledge of ES and how human activities impact their availability might serve as a starting point for such collaboration. In scenarios like restoration, water quality and eutrophication control, ES may be used to prioritise management choices as a next step.

We looked at the worldwide influence of humans on potential freshwater ES. The overall strategy was to determine what percentage of each possible ES category is presently in use. To begin, we created a set of indices to assess human impacts on continental seas, as defined by ES. Then, after each percentage was weighted by the ratio of the category's value to the overall potential value of ES across categories, a composite index was formed by adding those proportions. A biodiversity stress index, freshwater commodities stress index, disturbance regulation index, greenhouse gas release index, water quality stress index and water availability stress index were created to analyse human usage within ES categories [4].

These categories were chosen based on the characteristics of each ES for which we could obtain statistics indicating its level of usage. Our categories correspond to the providing, regulating, DRI and supporting categories in the Millennium Ecosystem Assessment, however they do not overlap with the cultural category. Then we looked at how different factors affect the degree of impact on each ES category index and the composite index [5].

Conclusion

We took use of the fact that each ES has a maximum potential value and has been allocated a value. Our studies, on the other hand, were not sensitive to the actual values assigned, but rather to the relative fraction of each category's value. As a result, we were able to scale the indices relative to each other and generate an overall index of worldwide human freshwater influence using the relative rankings of ES based on reported data.

Acknowledgement

Not applicable.

Conflict of Interest

Not applicable.

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