

## **Applying an economic value framework to ecosystem services from deep-sea vents**

Stace Beaulieu, Porter Hoagland, Christopher German, Maurice Tivey

Woods Hole Oceanographic Institution; sbeaulieu@whoi.edu

It is now commonplace for assessments of the economic values of ecosystem services (ES) to be carried out to account more fully for potential damages to the natural environment caused by human activities. Many opportunities exist for natural and social scientists to collaborate on research addressing the scales of ES values in the deep sea. A relevant concern now is the potential reduction in ES values that could result from the proposed mining of seafloor massive sulfide (SMS) deposits at deep-sea hydrothermal vents. A number of governments and private firms are engaged currently in the staking of seabed claims and the exploration of minerals on those claims. Some of these entities have begun to account for lost ES values should mining occur, employing methods that transfer estimated values from other contexts, locations, or circumstances. We use a total economic value framework to identify and categorize the potential losses of a wide variety of ES values that could result from the mining of active SMS deposits. Although it is not yet feasible to estimate accurately the scale of potential losses, we find that there are more sources of both “use” and “non-use” values than had been identified previously. Importantly, ES values may vary across human communities, and their scales may grow with scientific discoveries and public awareness. We expect that non-use values represent a significant proportion of the ES values that are likely to be lost through mining. Consequently, we argue against the casual transfer of ES values from other contexts. Finally, we suggest a prioritization of categories for the compilation and analysis of primary valuation data.