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The Services-Oriented Architecture: Ecosystem Services as a Framework for Diagnosing Change in Social Ecological Systems

Abstract

Computational thinking (CT) is a way to solve problems and understand complex systems that draws on concepts fundamental to computer science and is well suited to the challenges that face researchers of complex, linked social-ecological systems. This paper explores CT's usefulness to sustainability science through the application of the services-oriented architecture (SOA). The SOA is a popular organizational framework in information technology that enables businesses to describe the services they offer, including how, where, to whom, and under what terms these services are available to consumers. It provides a straightforward, scalable, and portable way to describe and organize complex business systems, with an emphasis on system controls and component interactions rather than on the system components themselves. Here, we present the SOA as a path to a more mature ecosystem services concept, in support of integrated assessment frameworks such as the Millennium Ecosystem Assessment (MA). With the SOA we capture important interrelationships among ecosystems, ecosystem service consumers, and ecosystem service governance authorities, particularly the effects of their interactions on the viability of ecosystem services. By standardizing the description and relationships involving ecosystem services, the SOA supports a diagnostic approach for evaluating stability and change in ecosystem service use across both space and time, when influenced by drivers of social, political, and/or ecological change, whether directional or stochastic, planned or otherwise. We present here a prototype of the SOA and illustrate its utility with an example from rural Alaskan communities.



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