

## **Complementing monetary evaluations by means of comprehensive environmental assessment of resources and services. The Emergy Accounting method**

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The prerequisite for a sustainable and equitable use of common resources (natural capital and ecosystem services) is the proper evaluation of their role within the complex network of relationships that ensure ecosystems functioning, resilience, and evolutionary dynamics. There is an increasing interest in comprehensive methods that help understand the value of such Commons, away from a mono-dimensional value system. Recent studies and reports highlighted the need for increased awareness and more appropriate accounting for natural capital and ecosystem services, by means of a variety of assessment tools across scales and criteria (MEA-Millennium Ecosystem Assessment, 2005; TEEB-The Economics of Ecosystems and Biodiversity, 2008; and the more recent Natural Capital Coalition, 2016, and its Natural Capital Protocol).

Point is now: Value for whom? How do we account for the value of resources and ecosystem services? How do we integrate biophysical accounting methods into the more conventional economic value systems? Monetary evaluation schemes, such as the so-called “willingness-to-pay”, provide a user-side evaluation perspective based on the idea that value only stems from utilization by humans. Concerns have been raised that putting a money value on the environment and applying market-based thinking to it turns the natural world into a commodity. Indeed “money is only paid to people and never to the environment for its work...” (Odum, 1996). Therefore, money and market values hardly capture the environmental complexity and the wealth received from the environment. As a complement to such ‘user-side’ point of view, the Emergy Accounting method (Odum, 1996) designs a supply-side system of value, based on the idea that a proper measure of value can be achieved by also accounting for the work done by the biosphere in generating services and resources at the larger scale in which human economies are embedded.

The emergy accounting method brings into the assessment the time for resource generation, the rate of resource exchange among components, the environmental quality of storages and flows within natural networks, with hierarchical levels supporting and feeding back each other for maximum power output. By assessing quantity and quality of resources, a basis for their environmentally sound management can be actually identified. The emergy method recognizes that the human/economic system is a subsystem of the larger geobiosphere system that provides flows of energy and material resources that directly or indirectly contribute to human quality of life. Within the interplay of human economies and Nature, it is very clear that a large fraction of resources and processes fall outside the conventional market dynamics and cannot be meaningfully valued by means of monetary assessment tools.

The proposed symposium explores how biophysical assessment methods, in particular the emergy method, can be integrated with socio-economic evaluations, to yield a deeper and more comprehensive understanding of the sustainability of production and consumption patterns of human societies, within the constraints placed by the need to preserve the fractions of natural capital and ecosystem services that must be left available to the other species as well as to the next generations.