

Appendix 1. The ES concept in the UNESCO Man and Biosphere (MAB) program

What is a Biosphere Reserve?

A biosphere reserve (BR) is an international designation by UNESCO in the Man And Biosphere (MAB) program. A BR includes one or several protected areas and their surrounding landscape to combine both biodiversity conservation and sustainable/wise use of natural resources. A BR is a place where local communities are involved in management through dialogue and concerted multi-stakeholder approaches. Through monitoring, research, education, and training, BRs aim to develop and demonstrate sound sustainable development practices and policies. In 2017, there are 669 BRs in 120 countries all over the world, connected through international, regional, and national networks promoting knowledge sharing and exchanges of experiences.

How is the ES concept operationalized in Biosphere Reserves?

Since 2013, the ES concept has been integrated in the requisite forms for BR creation or revision. Coordinators are requested to address the following:

- “- 12.1 If possible, identify the ecosystem services provided by each ecosystem of the biosphere reserve and the beneficiaries of these services.
- 12.2 Specify whether indicators of ecosystem services are used to evaluate the three functions (conservation, development, and logistic) of biosphere reserves. If yes, which ones and give details.
- 12.3 Describe biodiversity involved in the provision of ecosystems services in the biosphere reserve (e.g. species or groups of species involved).
- 12.4 Specify whether any ecosystem services assessment has been done for the proposed biosphere reserve”.

This requires inventory approaches, with objective ES assessments, rather than deliberations among people about ES management.

What are BR managers' needs regarding the ES concept?

Some BR coordinators are uneasy with the ES concept, the utilitarian perception of nature and the monetary valuations it embodies. Others perceive a potential to communicate about society's dependence on ecosystems. All in all, there is a need to operationalize the concept in a way that fits with MAB principles, especially bottom-up and territorial approaches involving local stakeholders. Since 2015, the French MAB committee has fostered a reflection involving researchers and BR managers on how to use the ES concept for BR management.

Why do research on ES in partnership with Biosphere Reserves?

The conceptual framework presented in this paper is the working basis of an action research project conducted in partnership with two Biosphere Reserves: Cévennes in southern France and Montseny in Catalonia, Spain. BR managers contributed to the elaboration of the framework and are participating in its implementation on the ground (work in progress). Partnerships with BRs are particularly relevant for implementing transdisciplinary research and producing actionable knowledge aimed at sustainable management of socio-ecological systems.