

# ECOSYSTEMS

Resources and natural environment



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## ECONOMIC ASSESSMENT OF ECOSYSTEM SERVICES:

### A tool for sustainable development in the Mediterranean?

Plan Bleu addressed this question as part of its assessments in order to come to more informed sustainable development policy decisions. These assessments cover various geographic levels (from local to regional) and different environments, such as marine, coastal and forest ecosystems. For instance, at the Mediterranean level, marine ecosystems were assessed in a study on the socio-economic impact of Marine Protected Areas, on the economic and social value of maritime fishing and on their related sustainable benefits. The goods and services provided by forest ecosystems were also examined in a socio-economic assessment. Finally, Plan Bleu recently launched a new study, which focuses on the economic assessment of services provided by wetlands in terms of adaptation to climate change.

Plan Bleu's experts used these studies and their expertise to analyse the interests and limitations of these socio-economic assessments on sustainable development in the Mediterranean region. The analysis focuses on strengths and weaknesses in communicating with decision-makers, and on the concrete ways to use these socio-economic assessments.

#### Why an economic assessment?

Environmental decisions are often complex, involving multiple criteria and many stakeholders with differing priorities and objectives. Selecting suitable management approaches or regulation processes often includes numerous criteria, such as cost and benefit distribution, environmental impacts for different populations, safety, ecological risks and human values (Kiker & *al.*, 2005). There must be a good understanding of the situation, stakeholders' needs and the consequences of the various available alternatives in order to take good decisions (Gregory & *al.*, 2012). Thus, to facilitate the decision-making process, different methods can

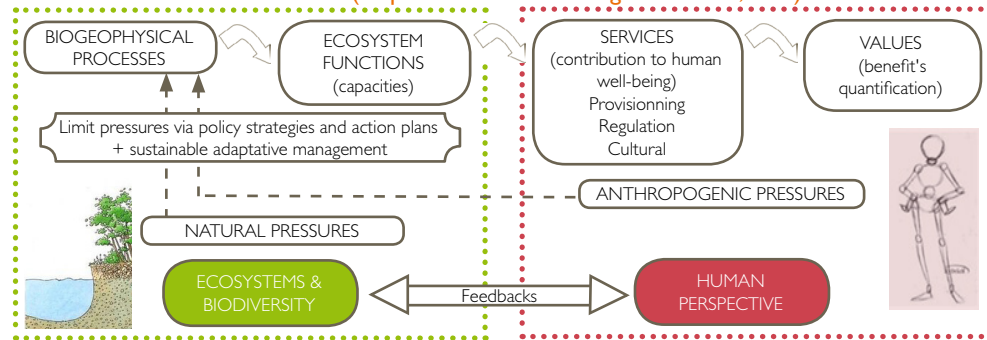
be applied for assessing the results, strengths and weaknesses of alternate management approaches.

#### A variety of services for a variety of ecosystems

At the international level, there are three classification systems for ecosystem services. In 2005, the Millennium Ecosystem Assessment (MEA) was the first to define ecosystem services as "the benefits people obtain from ecosystems". It provided the framework for The Economics of Ecosystems and Biodiversity (TEEB) and the Common International Classification of Ecosystem Services (CICES), which are now benchmarks for assessing ecosystem services.



Figure 1: Relationship between ecosystems and human well-being across the “chain of services” (adapted from Haines-Young and Poschin, 2010)



Plan Bleu used these three Ecosystem services as the basis for its work on this subject. Ecosystem services, also called ecological services, stem from the hydrological, biogeochemical or ecological functions inherent to ecosystems (Cf. Figure 1), and are classified according to three (CICES) to four (MEA and TEEB) major categories or types of services. The three categories used by all three differentiate provisioning, regulation, and cultural services. A fourth category known as habitat (TEEB) or Supporting Services (MEA) is debatable given that it might encompass a large number of services that depend on it in the other three categories.

Plan Bleu used its various studies to assess numerous goods and services (See Table 1) that represent the diversity of Mediterranean socio-ecosystems. Food production for marine and coastal ecosystems, eco-tourism and water purification for forest ecosystems, flood management for wetlands, and climate regulation for these three types of ecosystems are among the goods and services studied or being studied by Plan Bleu's experts.

The method applied in most Plan Bleu studies has three phases: a state of the art of current methods and tools available at the regional level, local implementation in pilot sites chosen for the way they represent specific aspects of the Mediterranean, and finally, results' extrapolation to the Mediterranean region.

## How are ecosystem services assessed in economic terms?

### Economic valuation vs. economic assessment

Economic valuation is the process used to estimate the monetary increase or decrease in well-being resulting from the use of a good or service (Romero, 1994). Economic assessment is the process that determines to what extent an alternative is able to meet the objectives, and the results achieved from this type of action.

Economic valuation can help improve the decision-making process as it provides insight into the social preferences for a wide range of environmental goods and services. Total economic value (TEV) is a concept that has been developed to ensure that all benefits are systematically and fully taken into account without double counting. The most important step in applying an environmental valuation method is defining the decision-making problem and the environmental change at stake. The second step consists in estimating the extent to which the environmental change will impact the flow of any associated ecosystem goods and services. The third step is to identify the individuals affected by the change. The distribution of potential costs and benefits and the scale at which they are

received are key elements. Local users are more affected by changes affecting direct benefits (e.g. the consumption and/or sale of forest products). However at national or international level, people attach greater importance to indirect services (e.g. carbon sequestration or preserving biodiversity).

### Economic valuation at the local level

At the local level, two types of economic valuation methods are generally used: revealed preferences and stated preferences. Revealed preference methods are based on the real consumer behaviour of users with respect to ecosystem goods and services. However, they can only be applied to a few goods and services.

Stated preference methods are survey-based approaches that use questions describing markets or hypothetical situations and can be applied to all types of ecosystem goods and services. However, their main disadvantages lie in the fact that they are based on hypothetical situations and require complex and expensive resources.

The majority of valuations carried out by Plan Bleu are based on the revealed preference method. Provisioning goods and services are valued using the market price method (e.g. production of cork in the Maâmora Forest<sup>1</sup>). Cultural goods and services are valued using the transport cost method or choice experiments method (e.g. recreation in the Düzlerçami Forest). Lastly, regulation goods and services are generally valued using replacement cost or avoided cost method (e.g. water purification in Chrea National Park). However, some regulation services, particularly carbon sequestration for Lake Burullus (Egypt) and Yeniçağa Lake and peatlands (Turkey), are valued using the market price method<sup>2</sup>.

The main limitation of these economic valuations is the lack of precise data. Approximations and assumptions have to be made. In some cases this makes valuations imprecise or limited to the site in question. They are therefore difficult to apply to other situations and even questionable. However, these methods are useful for showing that non-consumer goods and services can have a higher value than certain consumer goods and services (for instance, regulation services such as flood management or improved water quality).

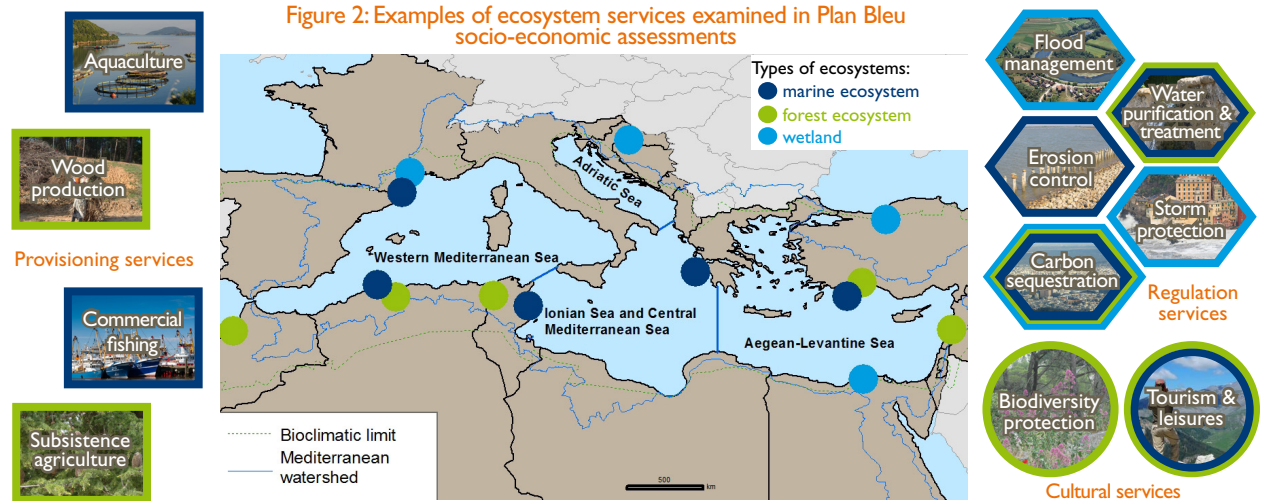
<sup>1</sup> Project « Optimizing the production of goods and services by Mediterranean forests in a context of global changes », in partnership with *Silva Mediterranea* Committee - FAO, funded by the French Global Environment Facility (FGEF)

<sup>2</sup> Med-ESCWET Project « Economic valuation of the ecosystem services provided by wetlands in terms of climate change adaptation in the Mediterranean », in partnership with Tour du Valat, co-funded by Mava and Prince Albert II of Monaco foundations



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### Studies at regional level

Plan Bleu analysed the economic and social context of marine and coastal ecosystems at the Mediterranean level and in its four major sub-regions.<sup>3</sup> This type of analysis had never been conducted on these scales, making relevant data hard to come by. The first step was to assess the sustainable benefits provided by these ecosystems. A sustainability criterion was introduced into the analysis, based on the estimated sustainable fraction of use for ecosystems. Market price measurements that could be compared with the national incomes of the countries in question were used. The critical lack of data, especially for non-European countries, led to various extrapolations using national statistics, particularly to isolate coastal values. The second step consisted of a socio-economic assessment of water uses and a valuation of the degradation cost. Two approaches were proposed: one using ecosystem services and one using the accounts of maritime activities. In this specific case, the ecosystem service approach could not be used because it requires extremely detailed knowledge of ecosystem services and the associated human activities, while having several pitfalls (double counting, missing information, multiple extrapolations). This approach generally is not used at the national or regional level.

The degradation cost can be defined as the cost of inaction. It represents what it costs society to have degraded ecosystems, as compared to a baseline condition with good ecological status achieved through relevant policies. In principle, it is easy to value but difficult to assess when fully taken into account. It requires that the benefits provided by ecosystem services be calculated in two distinct statuses. Three approaches were proposed: one using ecosystem services, a thematic approach, and a cost-based approach. The first requires extremely detailed knowledge of ecosystem services so that they can be imagined for the two statuses. The thematic approach covers a variety of methods aimed at reflecting existing data as far as possible, particularly by characterising the factors contributing to the degradation of ecosystems and by assessing the cost of the two statuses for society, including opportunity costs associated with the loss of benefits due to degradation.

The cost-based approach is limited to assessing those currently accepted by society to protect the environment (e.g. Protected Marine Areas) and reduce the impacts of degradation on human well-being (e.g. clean-up costs, fishing subsidies). This last approach only provides a low estimate of the degradation cost but has the advantage of being conceptually simple and providing relatively reliable results. The cost-based approach seems to be recommended at the regional or national level.

### The local assessment phase

After economic valuation, an assessment is carried out to help decision-making. The most commonly used tools for assessing alternatives aimed at achieving a given objective are cost-effectiveness analysis (CEA), cost-benefit analysis (CBA), multicriteria analysis (MCA) and life-cycle analysis (LCA) (Ozdemiroglu & *al.*, 2006).

Only CBA was used for forest ecosystems assessed by Plan Bleu. CBA is a decision-making method which compares all the relevant costs and benefits (in monetary terms) of an alternative (project, policy, or programme), including the impacts on environmental goods and services. It can be applied before (ex ante) and after (ex post) an action is taken. Its application to a given environmental entity/natural space is limited by the availability of necessary data on the economic value of the affected environmental good or service.

For instance, the CBA conducted at Chrea National Park (Algeria) compared alternative scenarios that seek to reduce the impact of excessive visitor numbers to the site, and particularly on Barbary macaque monkey (*Macaca sylvanus*) populations. Two scenarios were assessed. By calculating the additional net benefit of each scenario compared to the current scenario, the CBA showed that the "guided tours" scenario is more profitable than the "new recreation area" scenario.

For marine and coastal areas, the same method was used to study the effects of Marine and Coastal Protected Areas on various sites in the Mediterranean (e.g. Cap de Creus National Park in Spain, the Sensitive Area of the Kuriat Islands in Tunisia, etc.). This method takes into account consumer and non-consumer benefits and the costs associated with Marine and Coastal Protected Areas by developing alternative scenarios.

<sup>3</sup> Working programme on "economic value of sustainable benefits of Mediterranean marine ecosystems," funded by AFD, FGEF and AECID

### Interests and limitations of the economic and environmental assessment

Interests	Limitations
<ol style="list-style-type: none"> <li>1. Favour the inclusion of ecological services in calculations associated with public policies (e.g. satellite accounts of national accounting)</li> <li>2. Provide a better understanding of changes in the provision of goods and services</li> <li>3. Show the contribution of ecosystems to social protection and economic development</li> <li>4. Take into account non-consumer goods (e.g. regulation services) that sometimes have a greater value than consumer goods</li> <li>5. Provide a comparison with financial costs based on a common currency</li> <li>6. Create a common language for policy-makers, businesses and society</li> <li>7. Facilitate effective decision-making with respect to adaptive and sustainable management of Mediterranean ecosystems</li> <li>8. Serve as arbitration tools for public policies</li> <li>9. Create a basis for the implementation of natural resource accounting systems, payment systems for environmental services and mechanisms for effectively compensating damage to ecosystems</li> </ol>	<ol style="list-style-type: none"> <li>1. Lack of data and/or access to data, particularly in Southern and Eastern Mediterranean countries at specific levels (e.g. watershed, coastal region, etc.)</li> <li>2. Need for a prior biophysical study</li> <li>3. Problems getting a regional perspective due to site-specific characteristics, heterogeneity of data and methods</li> <li>4. Loss of information at each step and difficulty transitioning from the biophysical assessment to economic assessment stage</li> <li>5. Difficult to gain detailed understanding of the services provided by a site (to obtain the TEV) and their complex interactions</li> </ol>

Therefore, in addition to a business-as-usual scenario developed by analysing past trends and current intentions, two other scenarios were developed; one aimed at improving protection, and the other with less protection over the next ten to twenty years. The results were assessed based on the net present value (present value of benefits minus the cost). The benefits assessed focussed on fishing and tourism activities, scuba diving/snorkelling and excursions, as well as CO<sub>2</sub> storage, where the costs were those related to protection. The results are in favour of improved protection.

Findings from the studies confirmed that the protection of ecosystems should not be based on economic arguments, that extrapolations should be made with caution when developing prospective scenarios, especially considering the instability resulting from the economic crisis and Arab Spring. It is also essential to precisely define the point of view adopted (residents, policymakers, lending institutions, overall well-being) as what is seen as a benefit for some can represent costs for others.

### Can economic assessments be used to define indicators?

Despite the potential of using environmental economic valuation as a decision-making tool, some restrictions are involved. Many studies have been conducted, yet there is little feedback from their actual use.

The main challenges and limitations of environmental economic valuation are encountered in situations where there is a lack of training on the use of these methods, or when some services cannot be measured by a prior biophysical study.

It is important to understand that the fundamental goal of environmental economic valuation is not to put a price on an ecosystem or its components, but rather to express the relative importance of various ecosystem goods and services for populations. Consequently, assigning monetary value to them stems more from a need to establish indicators that can be used in decision-making processes rather than from a need to create a hierarchy of these goods and services. In the Mediterranean region, most of ecosystem goods and services are only traded on informal markets, or not at all, therefore it is important to appraise these values to help decision-making for allocating limited resources in order to manage ecosystems or for land-use change studies.

### Bibliography

- Gregory, R. et al. (2012). *Structured Decision Making: A Practical Guide to Environmental Management Choices*. Wiley-Blackwell
- Haines-Young R.H., Potschin, M.B. (2010). The links between biodiversity, ecosystem services and human well-being. In: Raffaelli, D. & C. Frid (eds.) *Ecosystem Ecology: a new synthesis*. BES Ecological Reviews Series, CUP, Cambridge
- Kiker G., et al. (2005). Application of Multicriteria Decision Analysis in Environmental Decision Making. *Integrated Environmental Assessment and Management*, Vol. 1, n°2, p. 95–108.
- Mangos, A. et al. (2010). *The economic value of sustainable benefits rendered by the Mediterranean marine ecosystems*. Plan Bleu Paper n°8
- Mangos, A., Claudot, M.-A. (2013). *Economic study of the impacts of marine and coastal protected areas in the Mediterranean*. Plan Bleu Paper n°13
- Ozdemiroglu, E. et al. (2006). *Valuing Our Natural Environment – Final Report*. EFTEC, London
- Romero, C. (1994). *Economía de los recursos ambientales y naturales*. Alianza.
- Sauzade, D., Rousset, N. (2013). *Greening the Mediterranean fisheries: tentative assessment of the economic leeway*

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