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Estimating the economic benefits and costs of highly-protected marine protected areas

Marine Protected Areas (MPAs) are an increasingly popular management strategy to conserve marine biodiversity and ensure sustainable human use of the oceans. We outline how to evaluate the economic benefits and costs of MPAs so that managers can obtain and use the best-quality economic information to guide decision making about MPAs.

Background

Marine Protected Areas (MPAs) are used to mitigate or lessen impacts on ecosystems due to human induced stressors, such as habitat degradation and climate change. MPAs also ensure sustainable use of oceans, generate important ecological benefits and act as a reference site in which ecosystem responses are measured.

There is controversy regarding the ecological and economic benefits provided by MPAs. Some international initiatives and conventions advocate MPAs while others express doubts about the ability of MPAs to deliver sufficient benefits. Economics can contribute to the debate by taking a whole of community perspective into account (see Figure 1) when evaluating whether an MPA provides benefits in excess of costs.

Economic Assessment

The identified ecological benefits of MPAs translate into diverse economic benefits, including market values, such as tourism expenditures, and non-market values, such as the value people place on protecting a threatened species.

Once values are quantified, a comprehensive economic evaluation can be conducted. The next section outlines the various components of such an evaluation, together with some key challenges to be aware of for each component. The results can guide decision-making on investments, including which MPA designs or locations offer the best value for money.

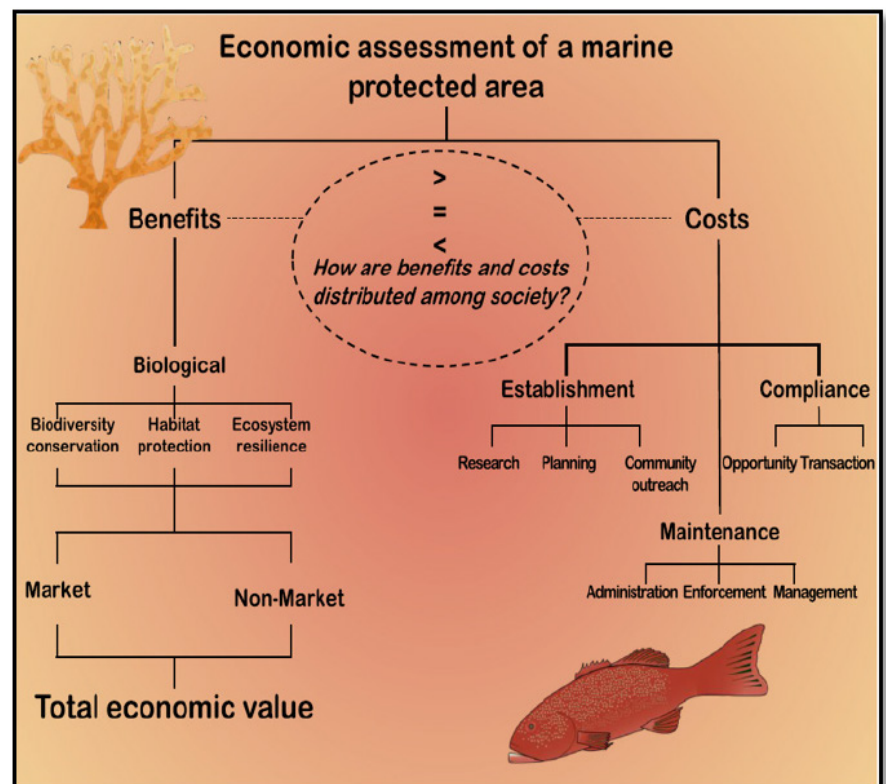


Figure 1: Components of a comprehensive economic assessment of MPAs (Davis et al. 2019, Ecosphere)

Quantifying the Benefits and Costs

<p>Identification of ecological benefits & costs are measured via empirical studies that quantify changes in:</p> <ul style="list-style-type: none"> ➤ Diversity, abundance, mean size, and biomass of target species through time or space. ➤ Distribution of biomass across functional trophic groups and size classes. 	<p>Challenges:</p> <ul style="list-style-type: none"> ➤ To understand changes caused by an MPA, the analyst needs to understand what would have happened without the MPA, allowing comparison of 'With vs Without' the MPA. ➤ Identification of a truly independent control site (a counterfactual) to indicate the without-MPA scenario. ➤ Varying management characteristics of MPAs (e.g., level of enforcement or compliance), which affect outcomes.
<p>Direct market benefits are measured through:</p> <ul style="list-style-type: none"> ➤ Businesses: increased tourism and fisheries' profitability—including changes caused by increased resilience to invasive species. ➤ Consumers: products and services that depend, to some extent, on MPAs. ➤ Local community (often represented by government): generation of jobs, fee revenue, and reduced expenditure to protect people and infrastructure. 	<p>Challenges:</p> <ul style="list-style-type: none"> ➤ Discriminating between domestic and international consumers and deciding on whether to include benefits received by international consumers. ➤ The complexity of causal links between ecological and market benefits. ➤ Avoiding double counting benefits.
<p>Quantification of non-market benefits is achieved via economic valuation studies using various methods:</p> <ul style="list-style-type: none"> ➤ Revealed-preference methods: Travel cost or hedonic pricing methods. ➤ Stated-preference methods: Contingent valuation or discrete choice experiments. 	<p>Challenges:</p> <ul style="list-style-type: none"> ➤ Revealed-preference methods only capture a sub-set of relevant values ("use values"). ➤ Stated-preference methods have broad coverage but rely on evaluation of hypothetical scenarios rather than observed data. ➤ Relies on people having an adequate knowledge and understanding of the issues they are being surveyed about.
<p>Establishment & Maintenance costs – these are measurable costs obtainable from the organisation(s) involved in the MPA. There are models available to estimate these costs.</p>	<p>Challenges:</p> <ul style="list-style-type: none"> ➤ Costs vary depending on objectives and attributes of MPAs. ➤ Difficulty predicting how long an MPA will take to establish.
<p>Compliance costs – these are the opportunity costs and transaction costs generated by MPAs. Opportunity costs include the profits lost when fishing is banned within an MPA. Transaction costs include the time spent learning about or administering MPAs, including through completing required paperwork or reporting.</p>	<p>Challenges:</p> <ul style="list-style-type: none"> ➤ Compliance costs depend on what businesses would have done in the absence of the MPA, which is difficult to identify. ➤ Transaction costs are rarely measured. ➤ Selecting a discount rate to assess future MPA benefits.

Reference

Davis, K. J., G. M. S. Vianna, J. J. Meeuwig, M. G. Meekan, and D. J. Pannell (2019). [Estimating the economic benefits and costs of highly-protected marine protected areas](#). *Ecosphere* 10(10): <https://doi.org/10.1002/ecs2.2879>

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Brochure: [Marine Capability Statement](#)

