INTEGRATED APPROACHES TO MARINE GOVERNANCE. A PERSPECTIVE ON SCIENTIFIC MODELING AND SOCIO-ECONOMIC ANALYSIS

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Abstract
On the eve of a new EU Maritime Strategy, scientific modeling and socio-economics are increasingly combined, promising a more effective and reliable approach towards sustainable use of marine resources. Presently, several integrated approaches to marine governance are designed and tested within international research consortia. Their research strategy is generally based on the understanding and quantification of the links between (ecosystem) functions and (human) uses, (nature's) services and (societal) well being. This paper aims at highlighting the main issues involved and offers a specific framework for integrating scientific modeling and socio-economic analysis. Topics to be discussed include: a) functions and servises b) scale mismatch, c) coping with non-linearities, d) evaluation of policies and societal objectives.
Keywords : Environmental Economics, Models.

Seas are notoriously complex and scientifically unexplored systems, encompassing highly variable biotic and abiotic components. On the eve of a new EU Maritime Strategy, scientific modeling and socio-economic approaches are increasingly combined, promising a more effective and reliable approach towards sustainable use of marine resources. Presently, several integrated approaches to marine governance are designed and tested within international research consortia. Their research strategy is generally based on the understanding and quantification of the links between (ecosystem) functions and (human) uses, (nature's) services and (societal) well being. What is the role of socio-economic approaches in informing marine policy and governance? And what does the recognition of marine ecosystem complexity entail for such approaches?

The term "socio-economic" approaches encompass a wide range of methodological tools and often quite diverging standpoints. "Speaking truth to power" means communicating to decision makers the appropriate mix of "facts and values" necessary for designing and assessing environmental policies; in this respect, neither pure scientific data nor subjective presumptions alone would be appropriate in informing public policy agencies. We limit the present discussion to four, we believe, central themes within environmental socio-economic approaches: a) functions and services, b) scale mismatch, c) coping with non-linearities and d) evaluation of policies and societal objectives. Ecosystem functions are processes describing physical, biological and chemical interactions in nature. Thanks to joint efforts with natural scientists, our 'production functions' linking natural and engineering processes with economic goods and services are far better understood. But functions are not to be confused with (ecosystem's) services: services are the end-products of functions, direct or indirect, influencing human well-being and therefore valued by humans in market or non market settings [1]. A first step towards a better communication between ecologists and social scientists depends crucially on clarification of terminological issues referred to ecosystem services.

Social sciences have a very limited use for the problem of (spatial) scale. In economics the problem resolves around the aggregation of individual data (microeconomics) into institutional ones (macroeconomics). Still, economics are quite flexible in accommodating different spatial scales by upscaling data from individuals to local, regional, national, supranational scales. Political science takes a different stance, since its main units of theorizing are stakeholder groups (families, trade unions, parties, administrations, etc). The problem is facilitated by appropriate scoping analysis. The methodological framework DPSIR (Drivers-Pressures-State-Impact-Response) offers a convenient platform whereby scale mismatches are made transparent [2].

With respect to economic valuation, two main conclusions can be drawn. Firstly, since we are forced to act in the face of potentially irreversible ecosystem change, we have to be proactive and, consequently, conservative in our management plans. A sustainable use of resources has to take into account the existence of thresholds and other irregularities in the functioning of ecosystems under what is widely known as "safe minimum standards" (SMS) approach ([3]). The above recognition enhances the relevance of *ex ante* economic valuation studies. However, it is plausible to assume that present societal preferences for environmental goods and services are fuzzy and lack articulation. The act of eliciting environmental preferences is therefore criticised as blurring the process of *eliciting* existing preference structures with that of *constructing* them. We can think of three possible ways to understand underlying preferences for environmental goods and services [4]: First, through observed choice, second, through verbal expressions and conversation, and third through observed adaptations due to learning. All three options have been to a lesser or greater degree utilised in the literature, spawning a variety of methodologies [5]. Analysts have investigated a wide range of valuation problems and contexts including, for example, the mismatch between expert and public perceptions of environmental quality in coastal areas; the differences between perceived and actual quality levels and their links to actual policy making and objectives setting; and the potential to combine quantitative and qualitative data using stakeholder focus groups.

The fact remains that complexity of both ecosystems and societies does not cancel out the need for hard choices in the face of both natural and societal uncertainties. As generally understood, environmental evaluation of projects and policies is a generic term relating to the identification, measurement and assessment of environmental impacts. Evaluation is a complex and multifaceted process involving a mixture of scientific and non-scientific approaches, a multitude of criteria and metrics. Evaluation is both a cognitive process as well as an institutional practice. It consists of a prior, analytical phase and a consequent synthetic phase. Analysis here means scientific identification and quantification of natural trends and impacts whereas synthesis is reserved for socio-economic and policy assessment of the impacts. The term valuation on the other hand is usually reserved for comparisons between objects while *economic* valuation refers to assigning *relative* values to mutually *exclusive* objects. Economic values are relative, because they assess the importance of objects/policies always in relation to foregone possibilities for alternative objects/policies. Economic objects/policies valued in this context are mutually exclusive because they are scarce, i.e. one cannot have all of them at the same time. Accordingly, economic values are practically trade-off coefficients denoting the quantity of a good a person is willing to give-up (usually income) in order to secure the consumption of another (environmental quality).

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