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BOOK REVIEWS

Handbook on the Economics of Ecosystem Services and Biodiversity, Eds., Paulo A.L.D. Nunes, Pushpam Kumar and Tom Dedeurwaerdere, pp. 608, ISBN: 978 178195 1507, online: £153.00.

Innovative approaches have been developed by economists to analyze various types of services and natural ecosystems. Part I of the handbook 'Setting The scene: the need for eco-system service valuation' lays the basis for further analysis in the book by a series of chapters on usefulness and limits of innovative approaches for improving and motivating policy action. Chapter I present the general framework of natural capital accounting as part of a more comprehensive approach for measuring long-term economic well-being. The analysis of natural wealth accounts over a decade from 1995 to 2008 shows as to how the economic development can be understood as a process towards building wealth. In this process, the composition of wealth has changed over the last decade; shifting away from natural capital and toward produced capita! and, increasingly, intangible capital. This changing composition has in return an impact on long-term human welfare. The accounting exercises provide the basic framework to better assess such impacts and the many trade-offs between the various forms of capital - for example, decay in natural capital can have an impact through the moral and aesthetic satisfactions afforded by preserving wild areas and the biodiversity they shelter. As highlighted by the authors, the main challenges in these accounting exercises is data availability and the development of more fine-grained indicators that can range from the building of single composite indexes lo complex multi-criteria indicators that do not presuppose substitutability among the different forms of capital.

The subsequent chapters in Part I address precisely this question of data contribution and modeling of various forms of capital by discussing specific case studies of biodiversity conservation and the ecosystem management. Chapter 2 addresses the question of protective value of estuarine and coastal ecosystems, mainly through their ability to attenuate waves or buffer winds in the case of storm and coastal floods. Chapter 3 extends this analysis of ecosystem services by addressing the long-term recreational value of ecosystems, through an analysis of ecological and social footprint of cruise tourism in Belize. Chapters 4 to 6 add to the analysis by integrating the indirect climate-related human impacts on ecosystem services and biodiversity conservation into the model. These chapters respectively

address the issue of marine fisheries, coral reefs and other marine ecosystems and show that when climate change has an adverse impact on ecosystem services, economic losses related to ecosystems decay can dramatically increase. All in all, the chapters in Part 1 show the need to integrate contributions by researchers from multiple disciplines, including economists, natural scientists and sociologists, to address the complex linkages between natural and socioeconomic processes in the flow of various ecosystem-related services-One of the core problems in the economic valuation of ecosystem services is to account For evolution of the actor's preferences regarding value of the services and the variation of these preferences according to social and cultural factors that lead to different outcomes at various spatial scales of analysis. Part IT on 'Emerging economic valuation methods' presents the recent work on valuation addressing this issue, by broadening the conventional toolbox and integrating deliberative, spatially heterogeneous and macro-level assessment techniques.

Chapter 7 presents general limits of the conventional Walrasiau welfare model for understanding human motivation for conservation and management choices regarding ecosystem services. The cornerstone of the Walrasian welfare model is an approach of human behavior that characterizes consumer preferences as stable, consistent, insatiable and independent of preferences of others. Recent work in economics has exposed flaws in this conventional model in particular, by showing that many preferences are 'other' regarding, as well as 'nature' regarding, and that these preferences vary significantly according to cultural conditioning, relative positioning and other reference points. Therefore, understanding the social process of preference formation and the integration of welfare modeling in broader spatial macroeconomic framework has become critical to formulating sound economic policies. Deliberative methods can contribute to this goal, along with the mapping of trade-offs and values at a macro-level of analysis. This broadened toolbox should facilitate clearer communication to decision-makers and the public, and thereby, could contribute to the formation of more collective preferences on biodiversity conservation and management of ecosystem services.

Chapters 8 and 9 show that it is possible to use a general equilibrium framework to assess micro-level welfare impacts of macro-level evolutions, such as climate change and agricultural production. Results highlight some well-known aspects of these macro-micro interactions, such as the contrast between regions that would benefit from climate-change-induced impacts, such as Mediterranean Europe and regions that would suffer, like many developing countries. Chapters 10 to 12 contribute further to the toolkit of methods that can ensure better knowledge generation for concerned stakeholders (including public officials, scientific experts and decision-makers). More specifically, Chapter 10 analyses the use of an important software tool,-Artificial Intelligence for Ecosystem Services (ARIES) by the US Bureau of Land Management. This software tool integrates a set of agent-based algorithms

that allow accounting for the spatial dynamics of ecosys¬tem service flows. Chapters 11 and 12 present respectively a selection algorithm for land allocation for the conservation of keystone species (Chapter 11) and a decision support tool, QUICKS for exploring various scenarios of land cover/use, which is applied to the case of the EU agricultural and environmental policy (Chapter 12). The common point highlighted by the authors of these various chapters is the importance of a proper design for the process of model choice and use. In particular, proper attention should be given to ensuring transparency in tool development, capacity strengthening to use a diversified toolbox and communicating results and improving exchange between developers and users (e.g., technicians, decision-makers, etc).

The extent to which the choices of protecting biodiversity versus promoting biodiversity-related ecosystem services are likely to coincide depends on complex and yet little understood interactions between biodiversity and ecosystem services. However, biodiversity and ecosystem services are in serious jeopardy and the best hope to protect them is to create and align diverse incentives for conservation wherever possible and to integrate these into the larger policy-maker arena. Part III on 'Ecosystem services and conservation policy' applies the insights on natural capital accounting, modeling and economic valuation developed in Parts I and II to this complex nexus between protection of biodiversity and management of biodiversity-related ecosystem services.

Chapter 13 sets the stage of this analysis by presenting a simple model of land allocation that integrates the economic opportunity costs of biodiversity conservation and provision of ecosystem services on the same land, the effectiveness of conservation and management efforts and population density. Some themes that emerge from the stylized model is that greater reliance on ecosystem services is not always attractive to a country -as alternative land uses might be preferred - and that the potential for synergies between biodiversity conservation and ecosystem services will increase with the number of ecosystem services that are considered (see also Chapter 19). These points underscore the importance of relying on a wide diversity of mechanisms to address conservation, some of which can be based on marketable ecosystem services, while others might address non-marketable services, such as moral and aesthetic satisfaction through subsidy schemes like payments for ecosystem services.

Chapters 14 and 15 analyze the impact on conservation decisions of the availability of marketable products from ecosystems, such as the valuable research derived from biodiversity prospecting or the presence of fisheries adjacent to marine protected areas. The analysis in these chapters shows temptation of actors to only consider the private benefit from the use of marketable products, while such strategic or short-term self-interested behavior does not always lead to the most socially desirable outcome. Further development of such studies at the intersection of conservation policy and management of ecosystem services, however, depends on the

availability of richer and more sophisticated data aggregation tools, as also stressed in Part I. Chapters 16 and 17 contrast the data needs and the role of uncertainty in modeling in the case of valuation of ecosystem services and the case of assessment of optimal biodiversity preservation policies respectively. Particularly in the first case, lack of high-quality data is a major barrier. As shown in Chapter 16, the building of a data portal for accessing all the existing valuation studies and a more systematic use of spatial data in these studies could contribute to alleviating this problem. Chapters 18 and 19 finally broaden the analysis of [he synergies between ecosystem services and biodiversity conservation by reviewing the literature on biodiversity, poverty and development on the one hand (Chapter 18) and the ecological-oriented literature on irreversibility and scale-dependency of certain services on the other (Chapter 19), In order to take into account this broader social context, both chapters advise looking at payments for ecosystem services (PES) as an important tool to provide necessary incentives for local conservation activities that yield wider social benefits.

The authors are looking at the types of valuation methods used in those studies that link valuation to policy and management approaches; there is a clear bias in favor of market-based methods in most of them. As also highlighted in Part III, this is unfortunate as it means that some important services are excluded, as existence values or aesthetic values, leading to the possibility of placing zero value on such services. Part IV on 'Shedding light on non-market values of ecosystem services' presents a wealth of original case study research showing the importance of non-market values within the ecosystem services framework.

Chapters 20 to 22 use choice experiments and contingent valuation techniques to value the non-use values in wetlands and coastal areas. Findings of these studies indicate the preference of users for more environmentally sound management scenarios, whether it is in the case of visits to coral reefs (Chapter 20) or restoration of wetlands (Chapters 21 and 22). However, even though these studies provide unambiguous evidence of the importance of non-use values, further research is needed to better assess the social costs of investment in the management and restoration of these areas. Chapters 23 and 24 aim at better integrating this cost dimension by using a total economic value method for integrating the market price in evaluation of the benefits, cost evaluation methods and data on non-use values gathered by choice experiments and contingent valuation. The resulting analysis of the value of un-extracted groundwater in an aquifer in Greece (Chapter 23) shows that the incorporation of the groundwater's indirect ecosystem value and the non-use value increase the overall value of the groundwater-related ecosystem services in the assessment exercise. In a similar way, the non-use values estimated in the study of Jardines de la Reina National Park in Cuba (Chapter 24) are higher than the use values in the two management scenarios that are analyzed in the case study. Chapter 25, finally shows the interesting result that although, respondents to a contingent

valuation survey show a clear interest and demand for man-made wetlands, they indicate a zero willingness to pay. Indeed, the respondents would prefer to allocate public payments for the construction of man-made wetlands, exploited on a commercial basis. The latter result provides an interesting alternative to the more conventional choice for a public management scenario, such as envisioned in the study of the management of groundwater in a groundwater-dependent ecosystem in Northern Finland (Chapter 26).

While the debate on economic tools and synergies between biodiversity conservation and ecosystem service management is clearly at heart of the major innovations in the field over the last decade, there are other equally important issues that determine conservation policies which are already mentioned above, like the role of governance.

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