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INTEGRATING ECOSYSTEM SERVICES INTO ASSESSMENT OF DIFFERENT MANAGEMENT OPTIONS IN A PROTECTED AREA: A DELIBERATE MULTI-CRITERIA DECISION ANALYSIS APPROACH

D. GRAZHDANI
Agricultural University of Tirana, Kamëz-Tirana, Albania

Abstract

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Nature provides us with the very essentials of life. It gives us clean air and water; enables us to produce and gather food, fuel and raw materials from the land and sea; regulates our climate; stems flood waters and it filters pollution. It also gives us personal benefits from enjoying it that increases our health and happiness. Collectively, these benefits are known as ecosystem services**.** Wetlands provide people with a wide range of benefits. Prespa Park is a good case study, as it is a wetland area of high biodiversity and long human history. It is situated in the Balkan Peninsula and is shared among the three neighboring countries Albania, FYR of Macedonia and Greece. A study to obtain information concerning ecosystem services issues in the Albanian part of Prespa Park (AL-Prespa) basin, south-eastern Albania, was conducted from 2008-2010. The main aim of the study was providing an assessment of services coming from a range of AL-Prespa ecosystems, and benefits of the services under different management options. In this study, the problem of how to address and solve the complex issues of assessing ecosystem services is addressed, using a public participation process aided by multi-criteria decision analysis (MCDA) method. The main elements of the approach presented in this paper are: an inventory process to focus on sets of ecosystem services in AL-Prespa, and the development of specific management practices for management of ecosystems services in AL-Prespa. The next step in the process used an options analysis approach to look at the highly ranked issues and services in more detail. This approach presents an important tool in an analysis of ecosystem services and is essential for identifying and prioritizing the relative importance of the services by ecosystems in a protected area.

Key words: AL-Prespa, protected area, multi-criteria evaluation method, deliberative process, citizen's jury, stakeholders

Introduction

Ecosystem services have been defined by Daily (1997) as the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life. Ecosystem services are the benefits that people derive from nature. Some benefits, such as crops, fish, and freshwater (provisioning services), are tangible. Others such as pollination, erosion regulation, climate regulation (regulating services) and aesthetic and spiritual fulfillment (cultural services) are less tangible. The term "ecosystem services" have been coined to describe the processes and conditions by which natural ecosystems sustain and fulfill human life (Constanza et al., 1997; Daily, 1997; Cork and Shelton, 2000; Pretty and Hardy, 2000; Cork et al., 2001; Proctor, 2001; Sterman, 2000). All, however, directly or indirectly underpin human economies and livelihoods. To enable the concept of ecosystem services to be applied in practice it is vital to both, to document and study the nature of the services provided by ecosystems, and to assess the value or importance (in economic and other terms) of the services in various decision contexts (Daily, 1997; Bennett, 1999).

Despite a general understanding that ecosystems are valuable, there is a need to know how valuable they are, and how the value of ecosystems is affected by different management actions (Pagiola et al., 2004). Despite their critical

E-mail: d.grazhdani@yahoo.com

importance, the capacities of ecosystems to provide these myriad services are being degraded at an alarming rate. In 2005 the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment, 2005), a four-year study of the state of the world's ecosystems involving more than 1300 experts from 95 countries, reported that over 60 percent of ecosystem services were already degraded. Concern has been growing over the last half century as evidence of decline in the world's ecosystems and ecologists, economists and other social scientists debate the underlying socio-economic causes. More than ever before in human history, people living in cities have lost their awareness of their reliance on natural ecosystems for food, regulation of the atmosphere and climate, purification of water, provision of building and raw materials for industry, protection from pests, diseases and extreme weather, and for cultural, spiritual and intellectual stimulation and fulfillment.

In this study, both multi-criteria decision analysis (MCDA) method and public participation process are combined to assessing ecosystem services, development of specific practices for management of ecosystems services, and an options analysis approach to look at the highly ranked issues and services in more detail in AL-Prespa. MCDA (Bana e Costa, 1990; Munda, 1995; Gal et al., 1999; Bojorquez-Tapia et al., 2005; Kiker et al., 2005; Hill et al., 2005; Malczewski, 2006; Proctor and Drechsler, 2006; Mendoza and Martins, 2006; Rauschmayer and Wittmer, 2006; Cook and Proctor, 2007; Hajkowicz and Collins, 2007), is a means of simplifying complex decision-making tasks which may involve many stakeholders, a diversity of possible outcomes and many and sometimes intangible criteria by which to assess the outcomes.

Formal public participation processes (Crosby et al., 1986; Kleinman, 2000; Smith and Wale, 2000; O'Neill, 2001; Carson and Marrtin, 2002; Ross et al., 2002) have also been successful in aiding understanding and meeting consensus in complex and difficult decision problems which involve more than one decision-maker. Van den Hove (2000) gives justification for participatory approaches to environmental problems based on the characteristics of environmental issues including complexity, uncertainty, large temporal and spatial scales and irreversibility. These physical characteristics can, in turn, have consequences for social characteristics of the environment therefore justifying a participatory approach to decision-making.

In this paper is reported on the inventory process and options for managing ecosystem services developed and tested in a case study of the AL-Prespa. The approach has the following elements: a) a semi-quantitative inventory of what ecosystem services are present in AL-Prespa, how they are being used, and what is happening to them under current land use regimes and activities in the area; and b) identification of major decision options for the future.

Materials and Methods

General Data on Case Study AL-Prespa

Prespa Park region is a good case study, as it is a wetland area of high biodiversity and long human history. It is located in the south-eastern part of our country, at the border to Macedonia and Greece (Figure 1). Decades-long efforts to draw attention to the need for the protection of Prespa region were crowned on the World Wetlands Day, February 2nd, 2000, when the three Prime Ministers jointly signed the Prespa Park Declaration.

The Prespa area in Albania, in 1999 was designated as a National Prespa Park (AL-Prespa) not only due to the specific geographical features, but and for its very high biodiversity, extremely rich flora and fauna and exceptional beauty; versatile cultural and traditional elements, valuable ecological sites, good food, picturesque villages and historical layers of Byzantine and Ottoman monuments that are spread across the basin. The distribution of villages and people located around the two Prespa lakes shows that approximately 5370 persons live in 12 villages, of which 75% are employed in agriculture. Livestock and fishing also contribute to the farmer's income. Farming consists primarily of small-scale production for personal consumption. It is labor intensive, with women's labor particularly important in crop production, and men's labor crucial in animal husbandry. Livestock husbandry is integral

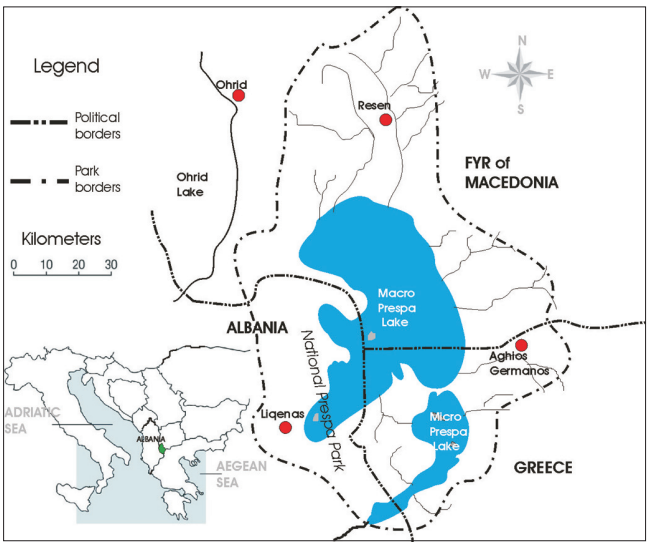

Fig. 1. Prespa Park watershed

to the farming system. Thus, almost all of the households hold one or two cows mainly for milk, ten to fifteen chickens and a few sheep and goats. The total number of agricultural holdings is about 1450 and they are all mixed holdings.

Recently a notable tourism "boom" began in its coast, almost 27 km long. Visitors value a very narrow component of the high natural and cultural assets of Prespa. In the five villages round the shoreline of Prespa it can be developed the familiar tourism during the whole year because the four seasons offer different tourist distinctions. Since 2002, ecotourism has been identified as a tool to that can value these natural and cultural heritages.

Questionnaire development

For this study, a self-administered questionnaire dealing with economic, social and biophysical profile of the study area was developed. The questionnaire items were written to reflect a series of different variables. Most of the questions are limited responses (yes/no or selection from a list), although some questions have a free-response data format. The questionnaire contained a total of 37 questions focusing on the variables of interest. More specifically, the collected data include: demographic characteristics of the farm households, such as family size, age, educational status; farm and non-farm income; the location and size of their parcels; major agricultural inputs and outputs; their perception on agricultural production; household assets; and geographic information, such as accessibility of the household to the basic infrastructures. To refine the questionnaire, a pilot test was conducted to clarify the comprehensiveness and potential areas of ambiguity (Fink, 2006; Nardi, 2006).

The questionnaire items were sent to a panel of experts to check the content and construct validity. Following the judgments and recommendations from the panel of experts, the questionnaire was revised as necessary. A field test was used to assess the face and content validity. 25 people were chosen to make comments on the questionnaire's clarity and ease of use. The suggested changes from the panel of experts and the field test were incorporated into the final draft of the questionnaire.

In this study, test-retest reliability and inter-item reliability were examined through pilot testing. Cronbach's alpha (α) was used to assess internal consistency: the closer the correlation is to 1.0, the more reliable it is (Nardi, 2006). In this study, the Cronbach's alpha (α) was 0.91.

Data survey collection and analysis

The data collection was conducted over approximately 20 days in the AL-Prespa watershed. In June 2008, from a small network of people (380) questionnaires was distributed to the residents in AL-Prespa. Each of the residents who took the questionnaire received a free scenic postcard of the AL-Prespa as a token of "thank-you" to ensure a high response rate based upon Dillman's tailored design method (2007). Respondents were asked to return the questionnaires in 5-7 days with a postage-paid envelope enclosed in the initial questionnaire. No monetary incentives were being provided to the respondents. The respondents filled out the questionnaires voluntarily. The initial packet that was sent to the respondents included the questionnaire, a contact letter, and a pre-addressed and stamped return envelope. The completed questionnaires were mailed back. The complete rate (the number of usable questionnaires) was 231 (60.8%).

Before the returned questionnaires were entered into the database, all of the questionnaires were examined to ensure that they were valid for the research. For data analysis, was employed SPSS 16.0.

Deliberative multi-criteria evaluation method procedure

In this study, the steps followed by multi-criteria decision analysis method were as follow: (a) *Choosing the options and objectives* which reflected the desired outcome of the decision making process to give clear and unambiguous purpose to the chosen option; (b) *Selecting the criteria*. The jury was given the task of selecting the criteria which were designed to compare and assess each of the options and therefore related to the overall objective of the decision-making task; (c) *Weighting the criteria*. In multi-criteria decision analysis, the preferences of the decision-maker were accounted for by the weighting placed on each of the criteria and sub-criteria. In this study, the eleven people choosing as "jurors" using a random sample of this relevant population in AL-Prespa and five experts were called as witnesses for determining the weights of the criteria. They discussed the relative merits of each of the criteria and call expert witnesses to help them reach a consensus on the weights; (d) *Assessing the options*. Beside the weightings of the criteria, the second component required in a multi-criteria evaluation is the assessment of the options with respect to each individual criterion. The result of this multi-criteria assessment was an impact matrix, where each of its elements represents the evaluation or impact of an option according to a particular criterion. Each criterion identifies a rank order of options determined by the degree to which each option performs in the particular criterion, and (e) *Aggregating the criteria*. In order to obtain a single compromise rank order, these multiple rank orders have to be aggregated in some way. There exists a wide range of aggregation algorithms (Bana e Costa, 1990; Gal et al., 1999). The aggregation procedure used in this study is based on the PROMETHEE (Preference Ranking Organization Method

for Enrichment Evaluations) multi-criteria decision aid which uses an outranking procedure as the basis of its evaluation (Brans and Mareschal, 1990). This procedure was utilized through the software program ProDecX which is also able to explicitly account for uncertainty when assessing various options (Klauer et al., 2002). In ProDecX, for each criterion, the weights are sampled from the weights given by the jurors in a fair way; i. e. the weighting of each decision-maker contributes equally to the final results.

Other data collection sources

This study was built also on the collection of secondary data pertaining to the study area (literature survey). This includes past research, local and international published materials, local and international reports and unpublished local information; Cases comparison**:** workshops organized with local stakeholders; Consultation of experts**:** Qualitative assessments of interactions between ecosystem services and land-uses were derived as expert judgments using staff from various institutions including Universities, Ministries, other research institutions, government land management agencies, and other stakeholders.

Results and Discussion

Achievements, findings, recommendations and future work arising from this study are summarized in the next sections.

Identifying the Higher-level Ecosystem Services in AL-Prespa

Studying every ecosystem service is impossible, so was used a participatory inventory process to select services more important to the AL-Prespa community. The procedure used in this study was carried out in following three steps: 1) describe the full range of goods (products) produced from the environment in the study area; 2) identify the dependence of these products on ecosystem services; 3) identify the ecosystem services of highest priority for further study and management.

During the first step, to assemble a comprehensive list of products from ecosystems that people value in economic or other terms, firstly were organize consultations with local stakeholders. Next, for identifying these products, was convened the first of the series of workshops involving scientists, economists, and representatives from agriculture, agencies and the general community within the AL-Prespa. On arrival to the workshop, participants were given background information on the study, a summary of the results taken by the survey, and how the research and workshop relate to this process. The findings of stakeholder consultations were also presented in order to get some feedback and ratification of this part of the research.

The list of these products included tangible, marketable commodities such as beef, wool and wheat, less tangible, marketable products like recreational opportunities, and intangible, often unmarketable products like aesthetic beauty, sites of cultural importance and intellectual or spiritual stimulation. To make later analyses manageable, the products were aggregated into groups on the basis of industries and land-uses expected to have similar impacts and management pressures.

Using this list of products/goods, the ecosystem services involved in the transformation of natural assets into those products/goods was derived in a second workshop with community members and scientists, and by local experts working as consultants. These people considered what ecological processes were important in producing the ecosystem products identified, and then aggregated these into higher-level services such as those in Table 1.

The inventory process also identified the following issues facing AL-Prespa Watershed management: The trend towards intensified land use in some areas, particularly for irrigated agriculture, will need to be carefully managed to avoid offsite impacts; Change in land ownership, particularly in areas close to center of the Pusteci Commune, which are being purchased by wealthy "lifestyle" farmers, provides a significant opportunity to improve environmental outcomes; Strategic re-establishment of trees and other vegetation is already a key issue in current sustainable forest management. An urgent task in restoring the full suite of ecosystem services is to quantify the multiple benefits of re/vegetation to further improve cost sharing arrangements; Watershed planning will need to take more explicit account of the life-fulfilling values of nature including indigenous culture and the intrinsic values of biodiversity, and landscape amenity; Management of soil (acidification, sodicity, soil carbon, breakdown of structure) and evaluating the services provided by soil biodiversity emerged as the single most significant on-farm ecosystem service issue for the watershed; Accounting, and explicitly planning for, the dependence of non-agricultural land and water values (tourism, recreation) on the catchments resources; The ecosystem services inventory has reaffirmed water management as a key issue for the AL-Albania Watershed with a focus on salinity, environmental flows, nutrient management and the potential conflicts with non-agricultural requirements (see above); The final, and potentially the most significant future management issue, is how to adaptively manage for emerging and longer term issues? Climate change, shade & shelter, waste management, pest control and

Table 1
Summary of ecosystem services inventory for the AL-Prespa

Ecosystem services	Land uses and activities									
	1	2	3	4	5	6	7	8	9	10
a. Life fulfillment	■	■	■	■	■	■	■			
b. Regulation of climate	■	■	■			■	■	■		
c. Biodiversity	■	■	■	■		■	■	■	■	
d. Provision of genetic resources	■	■		■						
e. Maintenance and regeneration of habitat	■	■	■	■		■	■	■	■	
f. Maintenance of soil health	■	■	■			■	■	■	■	
g. Maintenance of healthy water bodies	■	■		■	■			■	■	
h. Water filtration and erosion control	■	■	■			■		■	■	
i. Waste absorption and breakdown	■	■			■				■	
j. Aesthetic/scenic values	■		■		■			■		■

pollination all present potentially significant management issues that may need to be addressed.

Ranking of Ecosystem Services in AL-Prespa

Once the goods produced, and the role of ecosystem services were identified, the services were ranked in an iterative process involving local stakeholders and scientific experts. This process was fraught with difficulty because of the interconnected nature of the services and the different perceptions of the services people receive from ecosystems. Therefore, considerable effort was made to consult a wide range of stakeholders and experts, and to document the reasoning used in the process so that it could be assessed and reproduced by others.

For this reason, a third workshop, the procedure of which was to develop a set of ecosystem services related to land uses and activities in AL-Prespa and to identify some criteria for assessing and ranking these ecosystem services, was held.

The importance of each ecosystem service was considered in relation to each of the major groups of ecosystem products. The possible roles of each ecosystem service as an input to production of ecosystem products and/or in the maintenance of natural assets were considered separately. Three assessment criteria were used to assess relative importance: 1) Overall importance/impact: the overall importance of the service was considered in terms of the importance of the products to the AL-Prespa, the perceived importance of the ecosystem service to the products, and the impact of the land use/activity on the ecosystem service's capacity to maintain natural assets; 2) Importance at the margin: the impact of a small change in a service on the production of, or the maintenance of natural assets; 3) Manageability: the capacity to manage the land-use/activity to ensure the ongoing delivery of the service.

Given the purpose of the ranking (i.e. prioritizing key services and issues) and lack of information, only three levels of ranking, low, medium and high, were derived. For each land-use or activity, highly ranked ecosystem services were considered further by the expert consultants. For the highly ranked services, drivers of decline in service delivery were identified along with the observed impact and a set of possible ameliorative actions.

Ten major ecosystem services were identified and assessed against 10 groupings of land-uses and activities (Table 1). Key to column headings (land use): 1 – agricultural farming; 2 – livestock breeding; 3 – forestry; 4 – fishing; 5 – tourism; 6 – fruits and grapes; 7 – vegetables; 8 – grazing; 9 – management of solid waste and uncontrolled wastewater discharge; 10 – areas of cultural and historical options. Key to row headings (ecosystem services): a – life fulfillment; b – regulation of climate; c – biodiversity; d – provision of genetic resources; e – maintenance and regeneration of habitat; f – maintenance of soil health; g – maintenance of healthy water bodies; h – water filtration and erosion control; i – waste absorption and breakdown, j – aesthetic values.

Shaded cells are high-priority interactions between ecosystem services (rows) and land uses (columns) as judged by expert opinion.

Some ecosystem services, i.e. provision of genetic resources, are very important to a range of land uses but only appear to be of high priority as defined above for a few. Other services, like waste absorption and aesthetic values, appear to be at high priority points for most land uses. The local stakeholders and scientific experts placed overwhelming importance on only seven of the ten ecosystem services considered (life fulfillment, regulation of climate, biodiversity, maintenance and regeneration of habitat, maintenance of soil health, maintenance of healthy water bodies, water filtration and erosion

control). The process demonstrated that decisions on natural resource management can be very different when information on a full range of ecosystem services is available. It also demonstrated to the researchers and the decision-makers the importance of identifying the right questions to be asking and having the right information available in an appropriate form as part of the decision process.

Options for Managing Ecosystem Services in Study Area

Developing a set of plausible options for the future management of the AL-Prespa Watershed, and assessing how ecosystem services change under these different options, were also central components of this study. For this reason, a fourth workshop was held and run as a participatory process structured around multi-criteria analysis evaluations of the impact matrix. The main porpoise of the meeting was to develop the options.

Central to our analysis has been the development of an impact matrix. For this reason, eleven people were selected as "jurors", the choice of who were made using a random sample of the relevant population in AL-Prespa and five experts were called as "witnesses". Participants were introduced to the method, called deliberative multi-criteria evaluation (DMCE). Once the method had been described and discussed, participants were involved in setting up the DMCE, first by visioning some potential options for AL-Prespa. The jury was given the task of selecting the criteria which were designed to compare and assess each of the options and therefore related to the overall objective of the decision-making task. The jurors discussed the relative merits of each of the criteria and call expert witnesses to help them reach a consensus on the weights.

The selected options in this workshop were: 1. Continue current land uses; 2. Maximize ecosystem services; 3. Maximize social benefits; 4. Maximize economic benefits; 5. Sustainable production, environment, society.

An understanding of the above options was aided by the following framework that describes the makeup of each option in terms of specific management practices (Table 2). For example, the current option has some elements of on-site management practices implemented but none of those related to riparian zone management, demand management or education.

On site management: In areas of minimum impact, these can be used to good advantage. They can take the form of fences to keep people away from sensitive areas or keep vehicles and horses out. Boardwalks and bridges have been used in many tourist sites to stop the impact of trampling (erosion) and driving (pollution). Provision of toilets can minimize the effects of wastes polluting sensitive areas (as well as improving aesthetic values). Properly constructed car parks can keep vehicles confined to non-sensitive areas and away from areas where erosion could be significant. Horse yards in areas that are popular for horse riding can limit the effects of trampling and grazing by unconstrained horses. Weed control is another necessary on-site management ac-

Table 2
Frameworks for options

Management practices	Options				
	1	2	3	4	5
On site management:					
Fences	s	+	s	x	s
Boardwalks	s	+	s	x	s
Toilets	x	+	s	x	s
Car parks	x	+	s	x	s
Horse yards	x	+	s	x	s
Lakes harbors	s	+	s	+	s
Weed control	x	+	s	+	s
Riparian zone management:					
Fencing	x	+	x	x	s
Demand management:					
Marketing to more sustainable recreation activities	x	+	+	x	+
Scheduling/ closures/ limiting numbers	x	+	+	x	+
Marketing sustainable activities	s	+	+	x	+
Use of private land	x	+	+	x	+
Education:					
Signs/pamphlets	x	+	+	x	s

"+" = present, "x" = not present, "s" = some present.

tivity. It should be noted though that these sorts of man-made solutions can decrease the visual or aesthetic appeal for some people.

Riparian zone management: The riparian zone is that area beside the waterway that is essential to the health of the waterway. Correct management of the riparian zone can be crucial to the health of the waterway. It is also essential for the provision of shade. Riparian zone management can take the form of restricting access to these zones usually by fencing. Again, these sorts of interventions can decrease the aesthetic appeal.

Demand management: Marketing programs may be very effective. Such activities could include: targeting marketing to more sustainable recreation activities; scheduling and closures of sites and limiting numbers at peak times; user charges to limit numbers and fund programs; the use of private land where appropriate to supplement the "traffic" on public land; and targeting education, which can, over the long term, have significant impacts. This could include on-site education with pamphlets and signs to encourage users to take rubbish away, to keep out of certain areas and not to take firewood etc.

In this approach, each option was scored with respect to a set of indicators for each group of criteria. The options' workshop also helped to identify the relevant assessment criteria, and were considered important and have been applied the following nine criteria for the five options: Maintenance of water quality, biodiversity, nutrient management/waste assimilation, maintenance of healthy water bodies, maintenance of soil health, water filtration and erosion control, aesthetics views, public access, and cultural/heritage sites.

The ways in which each option was described, for example, the words and indicators used, formed the basis for the set of criteria by which each option would be evaluated. Participants were also asked directly what they look for in their surroundings to assess how things are going. These responses were used to fill out the list of criteria.

Finally, the impact matrix showing the value of each of the different criteria under each of the different options was completed (Table 3). The matrix included both qualitative and quantitative indicators as well as ranges for some indicators that were uncertain. Decision criteria are listed in the left-hand column followed by the indicator used to assess the criteria. The quantitative and qualitative values assigned to the criteria from available data and expert judgment form the body of the Table 3. This matrix represents a powerful tool for organizing complex information, ending the decision-making process and defining the scope of our analysis.

The results taken by ProDecX run indicated a top ranking of sustainable production, environment, society (option 5). The next best options were maximize ecosystem services**,** maximize social benefits, maximize economic benefits, and lastly, continue current land use.

Conclusions

This study has provided an overview of a multi-disciplinary analysis of ecosystem services in the AL-Prespa. Details of the conceptual basis of the study and the results of the analyses have been provided. It depends greatly on input from stakeholders in the region and biophysical, economic and social analyses that will complete the impact matrix used to decide between options.

This paper has revealed the development of a deliberative multi-criteria evaluation approach for assessing change in the provision of ecosystem services under alternative man-

Table 3
Impact matrix

Criteria	Indicator	Options				
		1	2	3	4	5
Maintenance of water quality	mg/l P	0.02	0.005	0.05	0.1	0.0
Biodiversity	QI[1]	7	10	4	5	10
Nutrient management/waste assimilation	QI	3	8	7	3	8
Maintenance of healthy water bodies	ISC[2]	35 - 41	42 - 50	35 - 41	26 - 34	35 - 41
Maintenance of soil health	QI	5	8	7	4	8
Water filtration and erosion control	QI	7	10	6	2	9
Aesthetics views	QI	5	8	6	2	9
Public access	QI	5	1	7	9	10
Cultural/heritage sites	BI[3]	1	1	1	1	1

[1]QI = Quality Index: high = 10, low = 1; [2]ISC = Index of Stream Condition: very poor = 0 – 19; poor = 20 – 25; moderate = 26 – 34, good = 35 – 41, very good = 42 – 50; [3]BI = Binar Index: 1 = present, 0 = not present.

agement options. Some practical steps on how this might be achieved have been presented here and these steps were applied to a case study identifying and prioritizing ecosystem services in the AL-Prespa, Albania.

The approach presented above is an important tool in an analysis of ecosystem services and is essential for identifying and prioritizing the relative importance of the services and goods produced by ecosystems. This was essentially a process to engage a wide range of stakeholders in thinking about the study area's values and challenges and to identify where is needed a more detailed quantitative analyses.

The key feature of the approach is its use to engage a broad segment of society in understanding and debating the benefits and costs of decisions that affect natural ecosystems. We are suggesting this approach as a complement rather than an alternative to more traditional approaches to decision making based on economics and policy or political sciences.

A high priority for future work is to analyze the institutions needed to maintain ecosystem services, and in particular explore ways of matching the scale and the design of institutions to the scale and nature of the ecosystem processes they are intended to influence. Another priority is to explore the feasibility of markets for ecosystem services, including the supporting institutions.

References

Bana e Costa, C., 1990. Readings in Multiple Criteria Decision Aid. Springer-Verlag, Berlin.

Bennett, J., 1999. Estimating the Values of Environmental Impacts of Agriculture. Country Matters Conference. Bureau of Rural Sciences.

Bojorquez-Tapia, L. A., Sanchez-Colon S. and A. F. Martinez, 2005. Building consensus in environmental impact assessment through multicriteria modeling and sensitivity analysis. *Environmental Management*, **36** (3): 469-481.

Brans, J. P. and B. Mareschal, 1990. The PROMETHEE methods for MCDM: The PROMCALC, GAIA and BANKADVISER software. In: C. A. Bana e Costa, (Editor), Readings in Multiple Criteria Decision Aid. *Springer-Verlag*, Berlin.

Carson, L., and B. Marrtin, 2002. Random selection of citizens for technological decision making. *Science and Public Policy,* **29** (2): 105-113.

Constanza, R., d'Arge, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., Oneill, R. V., Paruelo, J., Raskin, R. G., Sutton, P. and M. van den Belt, 1997. The value of world's ecosystem services and natural capital. *Nature*, **387** (6630): 253 – 260.

Cook, D. C. and W. L. Proctor, 2007. Assessing the threat of exotic plant pests. *Ecological Economics*, **63** (2-3): 594-604.

Daily, G. E., 1997. Nature's Services – Societal Dependence on Natural Ecosystems. *Island Press*, Washington.

Cork, S. J. and D. Shelton, 2000. The nature and value of Australia's ecosystem services: A framework for sustainable environmental solutions. In: Sustainable environmental solutions for industry and government. Environmental Engineering Society, Queensland Chapter, The Institution of Engineers, Australia, Queensland Division, and Queensland Chamber of Commerce and Industry, pp. 151-159.

Cork, S. J., Shelton, D., et al., 2001. A framework for applying the concept of Ecosystem Services to Natural Resource Management. Third Australian Stream Management Conference, Brisbane.

Crosby, N., Kelly, J. M. and P. Schaefer, 1986. Citizens' panels: a new approach to citizen participation. *Public Administration Review*, **46** (2): 170-178.

Dillman, D. A., 2007. Mail and internet survey - The tailored design method (2nd edition, 2007 update with new Internet, visual, and mixed-mode guide). *John Wiley & Sons Inc*., New York.

Fink, A., 2006. How to conduct surveys: A step-by-step guide (3rd Edition). *Sage Publications, Inc*., Thousand Oaks, CA.

Gal, T., T. Stewart and T. Hanne, 1999. Multi-criteria Decision Making - Advances in MCDM models, algorithms, theory and applications. *Kluwer*, New York.

Hajkowicz, S. and K. Collins, 2007. A review of multiple criteria analysis for water resource planning and management. *Water Resources Management,* **21** (9): 1553-1566.

Hill, M. J., Braaten, R., Lees, B., Veitch, S. M. and S. Sharma, 2005. Multi-criteria decision analysis in spatial decision support: the ASSESS analytic hierarchy process and the role of quantitative methods and spatially explicit analysis. *Environmental Modeling and Software*, **20**: 955–976.

Kiker, G. A., T. S. Bridges et al., 2005. Application of multicriteria decision analysis in environmental decision making. *Integrated Environmental Assessment and Management,* **1**: 91-108.

Klauer, B., M. Drechsler and F. Messner, 2002. Multi-criteria analysis under uncertainty with IANUS – method and empirical results. *UFZ Centre for Environmental Research*, Leipzig.

Kleinman, D. L., 2000. Science, Technology and Democracy. *State University of New York Press*, Albany.

Malczewski, J., 2006. GIS-based multi-criteria decision analysis: a survey of the literature. *International Journal of Geographical Information Science*, **20**: 703–726.

Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Current State and Trends. *Island Press*, Washington, DC.

Mendoza, G. A. and H. Martins, 2006. Multi-criteria decision analysis in natural resource management: A critical review of methods and new modeling paradigms. *Forest Ecology and Management,* **230** (1-3): 1-22.

Munda, G., 1995. Multi-criteria Evaluation in a Fuzzy Environment. *Physica*, Heidelberg.

Nardi, P. M., 2006. Doing Survey Research: A Guide to Quantitative Methods (2nd Edition). *Pearson Education Inc*., Boston, MA.

O'Neill, C., 2001. Understanding the impact of participation in a deliberative process: A social learning approach to citizens' juries. Developments in Public Participation and Innovations in Community Governance Conference, held at Universitat Autonoma de Barcelona, Barcelona, 7 - 9 June.

Pagiola, S., K. von Ritter et al., 2004). Assessing the Economic Value of Ecosystem Conservation. Washington D.C., World Bank.

Pretty, J. and B. R. Frank, 2000. Participation and social capital formation in natural resource management: Achievements and lessons. International Landcare 2000: Changing Landscapes, Shaping Futures, pp. 178-188. *Landcare*, Melbourne, Australia.

Proctor, W., 2001. Valuing Australia's Ecosystem Services Using a Deliberative Multi-Criteria Approach. In: European Society for Ecological Economics, Frontiers 1 Conference: Fundamental Issues of Ecological Economics. Cambridge, UK.

Proctor, W. and M. Drechsler, 2003. Deliberative multi-criteria evaluation: A case study of recreation and tourism options in Victoria. In: European Society for Ecological Economics Frontiers II Conference, Tenerife, Canary Islands.

Proctor, W. and M. Drechsler, 2006. Deliberative multicriteria evaluation. *Environmental Planning C: Government Policy,* **24** (2): 169-190.

Rauschmayer, F. and H. Wittmer, 2006. Evaluating deliberative and analytical methods for the resolution of environmental conflicts. *Land Use Policy,* **23** (1): 108-122.

Ross, H., M. Buchy and W. Proctor, 2002. Laying down the ladder: A typology of public participation in Australian resource management. *Australian Journal of Environmental Management*, **9**: 205 - 217.

Smith, G. and C. Wale, 2000. Citizens' Juries and Deliberative Democracy. *Political Studies*, **48** (1): 51 - 65.

Sterman, J. D., 2000. Business Dynamics: Systems Thinking and Modeling for a Complex World. *Irwin McGraw – Hill*, Boston.

S. van den Hove, 2000. Participatory approaches to environmental policymaking: The European Commission Climate Policy Process as a case study. *Ecological Economics*, **33**: 457-472.

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