Research Article

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Sustainable landscape management based on cultural ecosystem services

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Abstract: To sustain cultural ecosystem services and cultural heritage it is important to go in depth in the science policy interface, because efficient governance mechanisms emerge from the cooperation of scientists and practitioners. In the Basque Country, we are on the road towards adaptive and resilient landscape management through an integrative approach that enhances the link between science, policy-making and society. Key elements of this approach are: The establishment from the outset of a transdisciplinar community of practice; the creation of specific transdisciplinar working groups to go in depth with concrete applicability measures; a strong outreach strategy and educational programs development; and last but not least, the involvement of stakeholders at multiple stage of the process. Diverse research lines are carried out during the process (e.g. mapping ecosystems services, analyzing social perceptions), whose results are combined to help identify response options for sustainable landscape. Relevant policy implementations of the results of this broad research are already taking place in the Basque Country. The proved utility of this working mechanism makes key agents to continue involved, and to attract more agents into the process. These transdisciplinary processes facilitate the creation of synergies and win-win solutions towards sustainable management of cultural ecosystem services.

Keywords: Transdisciplinar, community of practice, collaborative work, science-policy interface, Ecosystem services

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1 Introduction

To sustain cultural ecosystem services and cultural heritage it is important to go in depth in the science policy interface, because efficient governance mechanisms emerge from the cooperation of scientists and practitioners [1]. In fact, integration between science, society and management is essential for an adaptive transition toward sustainability [2]. This has been internationally recognized with the creation of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, http://www.ipbes.net); an independent intergovernmental body that aims to strengthen capacity for the effective use of science in decision-making at all levels. Due to its applicability for management, the perspective of ecosystem services (ES) can contribute to develop sound land-use sustainable policies and planning actions at different scales. In fact, the ecosystem service framework, which explores the links between human well-being, the status of ecosystems and their sustainable use [3], provides a space for coordination and dialogue between different stakeholders (including scientist, managers, politicians and NGO representatives). Despite significant progress on the science-policy interface, practical policy implementation of ecosystem services at different scales follows a slow process [4,5] and many important issues towards sustainability on the field need further development [6,7].

Landscape scale (local-regional scale) provides an appropriate opportunity to lead further steps from theory to practice, giving insights and facilitating instruments that can contribute to the ecosystem services implementation at multiple scales [8]. Landscape-level socio-ecological assessments have been acknowledged to reinforce civic engagement and enable collaborative decision-making processes [9,10].

In the Basque Country, we are on the road towards adaptive and resilient landscape management through an integrative approach that enhances the link between science, policy-making and society. This integrative

approach counts with the participation and implication of researchers, local authorities, NGOs and other stakeholders [11]. The Basque regional ecosystem services assessment emerges as a valuable tool for ecosystem services approach practical implementation into concrete policies. Based on the Basque experience, the objective of this paper is to give guidelines on key governance and policy instruments or mechanisms that would contribute to the sustainable management of cultural ecosystem services in different regions and at different scales.

2 Organization structure, working approach and methodologies of the Ecosystem Services Assessment of the Basque Country

The Basque regional ecosystem services assessment, which started in 2008, develops an approach of integrative knowledge by complementing the knowledge obtained through participatory methodologies with biophysical and socio-economical qualitative indicators and analyses [12]. It therefore combines qualitative and quantitative data to study the biophysical and social dimension of ecosystem services in the Basque Country. In fact, the use of integrated and comprehensive ecosystem approaches has increasingly been acknowledged to maximize synergies and address trade-offs in socio-ecosystem management [13,14]. Moreover, in any national or regional ecosystem services assessment participation is key, specially to provide ownership and acceptance among the targeted decision makers and other users of the assessment results and findings [15].

Many up to date innovative ecosystem services methodologies are used during this assessment at different working scales, being the following the principal research lines carried out during the process: 1) Studying conditions & trends of Biodiversity & ecosystem services using indicators, and developing a multifunctionality indicator [16,17]; 2) Mapping ecosystems services at different scales taking into account all natural heritage (biological and geological heritage) [18,19], making special emphasis in mapping cultural ecosystem services [20,21]; 3) Analyzing social preferences (demand) and users' perceptions through participatory processes [22,23,24]; and 4) Developing future scenarios, both qualitative (participatory) [25] and quantitative (modelling) [26,27]. These research lines are interconnected. For example, Peña *et al.*, analyzed social preferences for mapping cultural ecosystem services [21]. Moreover, the results of these diverse methodologies are combined [12] to analyze the existing synergies and trade-offs and to identify response options for a sustainable management of ecosystem services, including cultural ES [28,29].

In this assessment, an active transdisciplinar core team integrated by politicians, technicians of different administration bodies, researchers specialized in the region and local NGO representatives was established from the outset. This transdisciplinar core team works actively as a community of practice [30,31] setting objectives and research questions, sharing data, identifying data availability as well as data needs, finding solutions to identified problems and more importantly, creating an iterative learning and practice process. Many relevant experts and politicians have been added along the way. Our working methodology has both, a clear coordination strategy that facilitates fruitful steps, and a flexible and fluent mechanism that allows creativity and facilitates real implementation of the assessment results and findings.

As the working team increased and applicability of results started to be imminent, specific transdisciplinar working groups were created to go in depth with concrete applicability measures. This way, specific groups were created to update the Urdaibai Biosphere Reserve Master Plan for Use and Management (MPUM), to update the Bilbao Metropolitan Landscape Planning (PTP) or to go in deep in the applicability of ES indicators at municipality level. Many groups are still ongoing (e.g., Regional and Landscape Planning working group and ES Indicators working group, where initial steps have been started to include ES Indicators into official statistics) and others are on the way to be created (e.g., working group to create a practical handbook to facilitate the inclusion of ES in Impact Assessments and Landscape Management). Before a working group is formalized, many specific meetings are carried out. In fact, Encouraging direct contact, continuous communication and specific meetings with different stakeholders has been an organizational characteristic of this assessment from the outset.

This assessment has from the outset a strong, continuous and transversal outreach strategy and develops educational programs for a variety of audience (postgraduate university studies, environmental education specialist, school teachers, administration technicians, local stakeholders and civil society). This tool for citizen awareness and education is considered essential in our assessment to ensure socialization and acceptance of results and findings. Proactive double way communication with stakeholders is sought, seeking the response of active agents. In this strategy, apart from the specific educational courses, the following means are

used: seminars, participatory workshop and conferences, publications, outreach materials, social networks, news release, radio interviews and videos.

The involvement of stakeholders at multiple stage of the assessment is a key characteristic of this assessment. We are aware of the importance of social participation as a means of ensuring the sustainable or wise use of natural diversity and ecosystem services [32]. For this reason, the general organization of our assessment counts on participatory processes at multiple stages, such us: participatory workshops, social perception surveys and face to face interviews, specific meetings with interest groups and many other open ways for receiving feedback input to the assessment.

As a transversal element to the assessment, we have an internazionalization strategy that serves us to receive international inputs at different scales and to contribute at international level with our experience. In this strategy several means are used, such as: organization of international conferences and meetings, contribution to international conferences and meetings, elaboration of scientific international publications, participation in international networks and collaboration and inter-exchange with other specialized teams.

3 Main results of the Basque ES Assessment related to mainstreaming and implementation of ES

This section briefly describes the results of the Ecosystem Services Assessment of the Basque Country on scientific production, on the outreach and education strategy and on the policy implementations achievements.

3.1 Scientific production

The Basque ES Assessment contributed to 13 International Scientific Indexing (ISI) publications, cited over 240 times in the web of knowledge. Additionally, a MAES Report includes our assessment results as a case study [33]. This assessment hosted two international relevant conference and meetings and made over 40 contributions in such ES related conferences (Table 1). Besides, the Basque ES Assessment is linked to relevant ES networks and collaborates with several research groups specialized in ES (Table 1). Importantly, the Basque Assessment is included in the IPBES Catalogue of Assessments on Biodiversity and Ecosystem Services (http://catalog.ipbes.net/).

Scientific production of the Basque Assessment always contains insight and recommendations for sustainable landscape management. As an example, Peña *et al.* [19] propose the inclusion of geosites into planning instruments of protected areas and facilitate tools and methodologies to do so. In the studies related to cultural ecosystem services, a spatial mismatch between recreation ES supply and demand was observed and communicated to decision-makers, who considered this results useful to identify areas that can be targeted for improvement of landscape and recreation management [20,21].

In line with the assessment communication strategy, all assessment results, reports and relevant materials are publicly available on www.ehu.eus/cdsea. Moreover, the ecosystem services maps generated in the assessment are publicly available in the Basque Government official cartography website (www.geo.euskadi.net).

3.2 Outreach strategy and educational programs

10 public events of different nature were organized in a period of 7 years. These events were reinforced with inputs and knowledge of international expert on ES. In these public events assessment results were presented and inputs from participants were received. This seminars, conferences and participatory workshops were broadly attended by a wide variety of stakeholders including public-administration technicians and policymakers (of different levels and administration bodies), researchers and local experts from different backgrounds, members of environmental associations, environmental education professionals, representatives from the agriculture and the forestry sectors, housekeepers, students and other members of the civil society. These public events were well reported in mainstream press, as well as other specific results of the assessment (Table 1).

Several specific educational courses and participatory workshops were held with key target agents, making use of the existing working networks. Such a target agent is the one formed by school teachers, scholar agenda 21 promoters and environmental education specialist, whose capacity to reach a wide range of audience is notable. Three specific workshops and educational courses were carried out with them and now a close collaboration exists to go in deep in the inclusion of ecosystem services concept into formal and informal educational system (e.g. professional training). Other target agent is comprised by politicians and experts of different administration bodies (technicians), whose influence in applicability of ES framework and

Table 1. General results of the Basque ES Assessment regarding scientific production, the outreach and education strategy and policy implementations achievements. For more detailed information see www.ehu.eus/cdsea

	Results obtained
Scientific production	
ISI publications	13 published articles, 2 articles under review, 243 times cited in Web of Knowledge
Organization/Host of international conferences and relevant meetings	2 international events organized (SGA Network meeting in 2011; Sustainability Pathways International Conference in 2011)
Contribution to international conferences and relevant meetings	2 Keynote speakers, 5 invited speakers, 13 oral presentations, 21 poster presentations, 1 stand
Participation in international networks	ESP, SGA, UNESCO, ENCORE (Regions of Europe), ENCA/EPA interest group on ecosystem services (IG ES), IPBES
Collaborations and inter-exchange programs	University of Nottingham (Roy Haines-Young and Marion Potschin), University of Amsterdam (Peter Verburg), INTA and National University of la Pampa, Argentina (Ernesto Viglizzo), Autonomous University of Madrid (Carlos Montes)
Outreach strategy and educational programs	
Organization of seminars, conferences, participatory workshops and training courses	3 conferences, 4 seminars and 3 participatory workshops were organized with successful assistance of a wide variety of local stakeholders. These public events counted on the inputs of international experts on ES.
	3 educational courses and workshops specifically directed to school teachers, scholar agenda 21 promoters and environmental education specialist were carried out
	Two specific training courses and three specific workshops were held with experts of different administration bodies (technicians) and politicians
	One on-line course directed to civil society
Postgraduate university studies	The Postgraduate Degree in Environment and Sustainability of the University of the Basque Country (60 ETCS) includes since 2009 a subject on Ecosystem Services, where the Basque Assessment results are presented. Besides, the researchers of the Basque team participate in other two postgraduate degrees where ES concept and some results of the assessment are presented.
Outreach publications and materials	2 different brochures in 4 languages
	2 specific educational materials
	A book on ecosystem services and human well-being with the Basque case study
	A book (in three languages) that reports the assessment results in a friendly, entertaining and educational way.
	5 book chapters
	A special issue on human well-being and ES in the Sustainability Forum Journal
	10 papers in educational journals with scientific content
Audio-visual media	10 radio-interviews, 9 promotional videos; with over 2500 views
News release	23 news release were well reported in mainstream press in different moments, 9 of them related to the public events organized and the others with specific results of the assessment
Social networks	The facebook of the project has over 270 followers (persons and entities) of more than 28 different countries

Policy implementations achievements	Specific improvements thanks to ES assessment
The Urdaibai Biosphere Reserve Master Plan for Use and Management (PRUG)	The renewed Plan incorporates changes in the conceptual framework of the Plan, where now conservation is focused in its relevance for wellbeing and the ES concept is included. Besides, the Plan includes an ES catalogue. As a novelty, the Plan increases in 4% the core protected zones. This increase is based on the assessment results that highlight the importance of natural forest for Biodiversity and ES conservation
The Bilbao Metropolitan Landscape Planning (PTP)	Combining the results of the several natural diversity and ecosystem services maps elaborated for the region, areas that currently notably contribute to natural diversity and multiple ecosystem services provision (multifunctional areas) are identified and proposed for green infrastructure development. Additionally, areas of high strategic value are identified to be added to this green infrastructure.
The Biscay 21 sustainability strategy	Specifically recognizes the relevance of this ES assessment for the sustainable development of the region
The Regional Planning Guidelines for the Basque Country (DOT)	ES framework and concepts are incorporated in this Regional Planning, and ecosystem services maps are included as planning tools

research insights into management is high. Two specific training courses and three specific workshops were held with them, with a successful attendance and a fluent participation. Besides, as explained in the methodology section, specific collaborative work is being carried out with this target group for concrete implementation achievements. Additionally, the assessment team participated in several related local, regional and national seminars, workshop and conferences where results and knowledge were shared.

In relation to the educational program, we also offer an on-line course on ES for civil society and participate in three postgraduate degree studies with a seven year contribution on ES (Table 1).

The communication strategy has lead to several outreach publications and materials including two books, five book chapters, ten papers in educational journals with scientific content, two brochures and two specific educational materials (Table 1). Special mention goes to the book by Onaindia *et al.* [11] where all the results of the Biscay province scale were published in a friendly, entertaining and educational way, and where recommendations for management were included. Audio-visual media and social networks have also proven to be useful outreach tools (Table 1).

3.3 Policy implementations

Relevant policy implementations of the results of this assessment are already taking place in the Basque Country thanks to the collaborative work already mentioned. Examples include: The Urdaibai Biosphere Reserve Master Plan for Use and Management (PRUG), The Bilbao Metropolitan Landscape Planning (PTP), The Biscay 21 sustainability strategy and The Regional Planning Guidelines for the Basque Country (DOT). Many specific improvements have been made to these policy instruments thanks to the Basque ES assessment (Table 1). In Urdaibai Master Plan, the collaborative work served not only to include the ES conceptual framework and an ES catalogue in the Plan, but also, research results on ES served to increase in 4% the protected core areas. In the Bilbao Metropolitan Landscape Planning a green infrastructure development proposal is included based on ecosystem services multifunctionality. The Regional Planning Guidelines for the Basque Country considers the ES framework and the Basque ES assessment results as key planning tools. Besides, some municipalities involved in the assessment are already making use of the ecosystem services indicators developed for municipality level (e.g. the municipality of Ayala is using the ES indicators in their sustainability projects).

Apart from the ES implementation results obtained thanks to the direct collaborative work specific for each policy instrument, we have been informed of concrete indirect implementations that are taking place thanks to the assessment results data availability. Such is the case in two LIFE+ projects of the Basque Country that used assessment results (e.g. maps) to evaluate the positive impact of the project and in some Evaluation Impact Assessments of civil works of the region where ecosystem services have been included thanks to the assessment results.

Near future implementation steps include the creation of a practical guide to facilitate the actual implementation of ES concept in planning and the inclusion of ecosystem service indicators in official statistics.

4 Discussion

4.1 Searching for effective governance instruments for sustainable management of cultural ecosystem services: lessons learned from the Basque experience

The internationalization strategy has lead to productive scientific results and insights, improving data credibility, considered essential when ES assessments are used to support public decision making [34], and allowing engagement with the wider ES community and scaling of results. Moreover, our assessment has gained relevance among local policy-makers and stakeholders thanks to the obtained international linkages and scientific recognition. Our collaborative and participatory working approach was crucial for gaining relevance and acceptance among stakeholders, as well as for making possible the real implementation in management of the assessment results and findings. In fact, communities of practice effectively inform decision-making while guide scientists on policy-relevant ecosystem service research [35]. Moreover, the impact on policy agendas and policy planning of ES research depends on how scientists are engaged in the policy processes [36].

The outreach strategy and educational programs applied were pillar to the overall assessment working approach, allowing a broad socialization of the ES concept and the assessment results and findings, and therefore, facilitating mainstreaming of ES. In fact, the perceived added value of applying the ES concept lies in communicating to different stakeholder groups the contributions and values of ecosystems and natural diversity (biodiversity and geodiversity) to human-wellbeing [5,19].

The applied organization structure and working approach helps to create bridges between science, society and policy-making, and therefore may give insight on effective governance instruments that would contribute to the sustainable management of cultural ecosystem services. From the Basque Assessment we have learned-by-doing [37] some lessons that help to answer the research question of how can we integrate ecosystem services assessment, and in particular cultural ecosystem services, into sustainable landscape management:

- Integrating the ES concept in planning depends on the existing governmental planning instruments [5] and working mechanism. Our experience highlights the importance of making use of existing interesting instruments and mechanisms to create synergies and look for win-win solutions, while facilitating additional tools, instruments and working mechanism to make further steps in mainstreaming and implementing ES in landscape planning and decision-making.
- Working collaboratively between different actors helps in the usefulness of the ES results and favours their acceptance and implementation [15]. Moreover, for ecosystem service research to be user-inspired and user-useful it is required that researchers respond to stakeholder needs from the outset and collaborate with them in strategy development and implementation [8].
- Communication is crucial, especially when it contributes to social learning, negotiation and the development of common meaning and visions [5]. Our results show the importance of facilitating spaces for coordination and dialogue between different stakeholders to contribute to social learning and develop common visions [24,25]. Besides, as ES-based information may be understood differently by actors with different background and interests [36], focusing the outreach strategy and educational programs to different target groups and working scales guaranties a deeper understanding and a more concrete usefulness of the outcomes.
- Maintaining scientific accuracy as well as international linkages is important.
- To set and maintain this working framework a strong policy involvement is needed. Our experience shows that the proved utility of this working mechanism makes key agents to continue involved, and to attract more agents into the process. The more actors of different backgrounds and positions are involved and convinced, and the more concrete successful results are implemented, the more stable becomes this working framework.
- The availability of useful ES results, materials and tools facilitates ES mainstreaming and implementation. This is especially true if the available information comes together with educative programs and collaborative work.
- Due to the perceived usefulness and because a lack of practical guidelines illustrating the actual application of the ES concept in planning was identified [5], near future implementation steps in the Basque Assessment include the creation of a practical guide to facilitate the actual implementation of ES concept in planning.

In conclusion, in transdisciplinary processes the combination of many different mechanisms can be

used to facilitate collaborative work and social learning and therefore, mainstreaming and implementation of ES for sustainable management. The beginning might be difficult, but as the process develops synergies and win-win solutions appear.

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