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Towards a Participatory Integrated Assessment Approach for Planning and Managing Natura 2000 Network Sites

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Managing protected areas implies dealing with complex social-ecological systems where multiple dimensions (social, institutional, economic and ecological) interact over time for the delivery of ecosystem services. Uni-dimensional and top-down management approaches have been unable to capture this complexity. Instead, new integrated approaches that acknowledge the diversity of social actors in the decision making process are required. In this paper we put forward a novel participatory assessment approach which integrates multiple methodologies to reflect different value articulating institutions in the case of a Natura 2000 network site in the Basque Country. It integrates within a social multi-criteria evaluation framework, both the economic values of ecosystem services through a choice experiment model and ecological values by means of a spatial bio-geographic assessment. By capturing confronting social and institutional conflicts in protected areas the participatory integrated assessment approach presented here can help decision makers for better planning and managing Natura 2000 sites.

Keywords: Social multi-criteria evaluation; Choice experiment; Bio-geographic assessment; Participatory process; Natura 2000 network; Basque Country.

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1. INTRODUCTION

The protection of natural areas has traditionally rested on top-down approaches in which ecological and landscape values prevailed over socio-economic and institutional aspects. More recently the planning and management of natural protected areas (PAs) has evolved towards a more inclusive approach in which local communities and their values are better acknowledged and included in decision making processes. However, the interaction between multiple actors and stakeholders opens up new sources of land use conflicts (Stoll-Kleemann, 2001). New governance solutions based on fostering social capital and collective action are required to defuse these conflicts towards more effective conservation measures that consider the active involvement of diverse social actors (Bergseng and Vatn, 2009; Beunen and de Vries, 2011; Dougill et al., 2006).

While conservation policies in PAs need to consider that such areas are complex social-ecological systems (Berkes et al., 2003), their formulation are still usually framed in terms of uni-dimensional approaches, mostly from traditional disciplinary approaches (silos) such as ecology, economics, sociology and environmental law.

In economics, the standard approach to evaluate policies associated with PAs and the ecosystem services supplied by them is mainly based on cost-benefit analysis which reduces a complex reality into an efficiency problem that is based on a reductionist monetary prism (Wegner and Pascual, 2011). This risks an ubiquitous commoditisation of PAs and disregards existing or emergent social and institutional conflicts that might arise as a result (Gómez-Baggethun et al., 2010). Multi-criteria evaluation provides an alternative interdisciplinary and participatory approach to evaluate conservation policies (Nunes et al., 2003), especially in the light of multiple legitimate but often confronted perspectives within a complex social-ecological context (Messner et al., 2006; Pascual et al., 2010; Proctor and Drechsler, 2006).

The application of multi-criteria evaluation to PAs has been limited so far, and mostly focused on the selection of ecological principles to prioritise conservation areas without taking into account stakeholders' interests and other social and institutional aspects (see e.g., Martínez-Harms and

Gajardo, 2008; Portman, 2007). This is despite its flexibility to incorporate economic and social aspects in the evaluation framework (see e.g., Oikonomou et al., 2011; Strijker et al., 2000) and the recent findings in the context of identifying ecological evaluation criteria about the existence of latent conflicts between economic development and environmental conservation in PAs (Parolo et al., 2009; Rossi et al., 2009).

The conservation/development conflicts within the Natura 2000 network (N2000) in Europe attest to the need to consider broader aspects that include socio-economic and institutional factors in the N2000 evaluation exercises, thereby implying the need to involve diverse social actors that have so far been neglected (Paavola, 2004). So far only narrow scientific criteria have been undertaken for the design of the N2000 network across Europe mostly disregarding complex socio-economic issues and public participation in the decision making process (Paavola et al., 2009). The result is that the role of local social actors, including government departments, NGOs, farmers, local authorities, etc. regarding their contribution to the understanding of complex and uncertain circumstances tends to be largely neglected (Kasemir et al., 2003).

Here we argue that interdisciplinary approaches that take into account the best available knowledge in different scientific fields while fostering the participation of a broad spectrum of social actors can help to reduce unnecessary institutional conflicts while enriching the formulation of sound planning decisions in the context of N2000 network. This is illustrated through a case study based on a Southern European N2000 site located in the Basque Country. In this case, we show how a social multi-criteria evaluation (SMCE) can integrate the economic valuation of ecosystem services through a choice experiment (CE) approach and a bio-geographic assessment that puts emphasis on the ecological value of the site. The SMCE presented here is an example of an integrated assessment approach for land use planning in as it allows a flexible evaluation of alternative management options in N2000 sites. The general methodological approach presented here is applicable to any PA and hence we describing in detail the way the participatory integrated assessment has been carried out in the Basque case study of the N2000 site.

The next section introduces the SMCE as the general methodological framework. Section 3 briefly presents the case study of "Garate-Santa Barbara" N2000 network site in the Basque Country. Section 4 describes in detail the methodological approach of the participatory integrated assessment process based on the case study. Section 5 presents the main results of the assessment. Finally, section 6 concludes by discussing the key findings to shed light on the potential applications and limitations of the assessment framework for evaluating management options in other PAs.

2. METHODS

The SMCE framework has been adopted to structure a participatory integrated assessment process that aims to evaluate alternative management options for a N2000 site. The main feature of the SMCE framework is its ability to take into account the multidimensional nature of complex social-ecological systems from an interdisciplinary and inclusive perspective in a transparent and deliberative way (Munda, 2004, 2008). The SMCE is based on the active involvement of a diverse group of social actors in the creation, valuation and validation of assessment criteria and evaluation alternatives.

SMCE has been used as a decision support framework to many social-ecological issues, e.g., water management and governance (De Marchi et al., 2000; Paneque et al., 2009), urban sustainability (Munda, 2006), regional development (Gamboa, 2006), rural electrification and solar energy (Munda and Russi, 2008), environmental risk assessment (Roca et al., 2008), integrated management of coastal zones (Garmendia, Gamboa et al., 2010), and the invasion of alien species (Monterroso et al., 2011). To the best of our knowledge in the context of PAs it has only been recently used for environmental planning (Oikonomou et al., 2011). Here we show how an SMCE framework can be used to come up with alternative management options for PAs.

An SMCE framework has four key features that makes it suitable for decision making related to PAs: (i) it can provide an integrated approach regarding multiple (complementary) scientific disciplines which are needed for a full-covered assessment; (ii) it can enhance a collaborative social learning process among diverse social actors with confronted interests and perspectives; and (iii) it can include feedback loops that allow reframing the issue at hand according to the best available knowledge and new values that can emerge during the evaluation process, and (iv) it is flexible to integrate other valuation approaches (Figure 1), an important feature that has been usually ignored in regard to PAs.

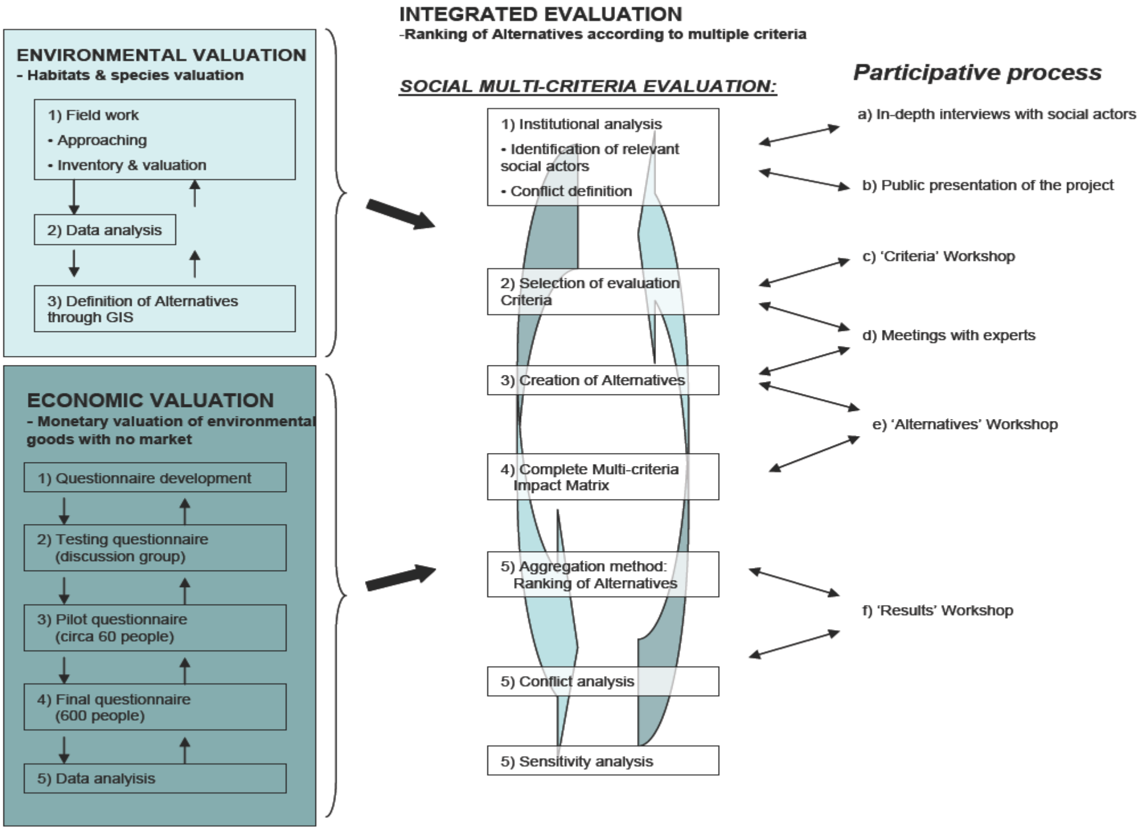

Figure 1. General methodological framework

The SMCE process used here comprised several phases (c.f. Figure 1). First, an institutional analysis was undertaken as a method for public policy analysis, to better understand the historical roots of a given conflict and explore its social-ecological scope. This step encompassed the identification of social actors and the definition of the problem at hand according to different perspectives (i.e. structure of the institutional network, and kind of interaction and context in which it takes place). The second step was the selection of the assessment criteria based on an open dialogue between an interdisciplinary group of researchers and a selected group of social actors representing the variety of interest. This was followed by the identification of management options for the N2000 site, or so-called alternatives. This creative phase was also based on public and expert deliberation. After having defined the relevant evaluation criteria and constructed the alternative management options, an ‘‘impact matrix’’ was built where each alternative was assessed according to its impact on the selected criteria and served to identify plausible trade-offs among the selected evaluation criteria. The next step involved the selection and application of an algorithm to obtain the ranking of alternatives according to their overall performance (see e.g., Figueira et al., 2005; Montis et al., 2004).

In order to check the robustness of the results a sensitivity analysis was then conducted by controlling for changes in key parameters and underlying assumptions, thereby helping to guaranty transparency within the evaluation process.

In addition, within the SMCE exercise a conflict analysis was carried out to test the robustness of the results from a social perspective. This analysis revealed the position of each actor relative to the others and to the alternative management options under consideration. It served to identify plausible coalitions among social actors thereby being helpful to understand how compromise solutions could be reached by making explicit potential ‘‘winners’’ and ‘‘losers’’ of different management alternatives in the N2000 site under consideration. It is important to note that the usefulness of this method relies on supporting a deliberative dialogue among all the counterparts but cannot be used as a substitute of the latter. While this may be considered the last step of the assessment process, we also stress that the process itself may reveal more existing conflicts opening up the possibility to reframe the issue at hand differently.

3. THE CASE STUDY: GARATE-SANTA BARBARA NATURA 2000 NETWORK SITE

Alongside the increasing concern about nature conservation in Europe, the Basque Country has also witnessed a significant increase of land area under protection since the 1990s’ through its *Nature Conservation Act, 16/1994.* Regarding the N2000, up to date 52 *sites of community interest* (SCI) and six *special protection zones for birds* (SPZB) have been designated to date[1], involving 147.000 ha (20,3% of the territory). Countries have to designate SCI as *special conservation zones* (SCZ) including a set of conservation measures or a management plan for each site within 6 years from the declaration as SCI by the European Commission. All the sites under SCZ and SPZB, designated exclusively according to scientific and technical criteria, will encompass the N2000 network in the Basque Country.

The SCI known as *Garate-Santa Barbara* (GSB) is the case study site were the SMCE has focused on. The GSB case study belongs to the Atlantic biogeographic region and is located in the Basque province of Gipuzkoa, between the villages of Zarautz and Getaria (Figure 2). It is a relatively small site covering about 142 ha, all of which are under a private property land tenure regime. GSB became part of the European list of SCI in 2004 (code: ES2120007) and it was updated in 2008 (Commission of EC, 2004, 2008). The main reason for the inclusion in the European list of SCI is the presence of five types of environmentally valuable habitats according to Annex I of Habitat Directive: *Quercus suber* forest; *Quercus ilex* and *Quercus rotundifolia* forest; European dry heaths; endemic oro-Mediterranean heaths with gorse; and lowland hay meadows (*Alopecururs pratensis, Sanguisorba officcinalis*).

[1] The existing SCI have been designated according to Annex I (habitat types) and Annex II (habitats of species) of the Habitat Directive (92/43/EEC) and the SPZB have been designated according to specifications under the Bird Directive (79/409/EEC).

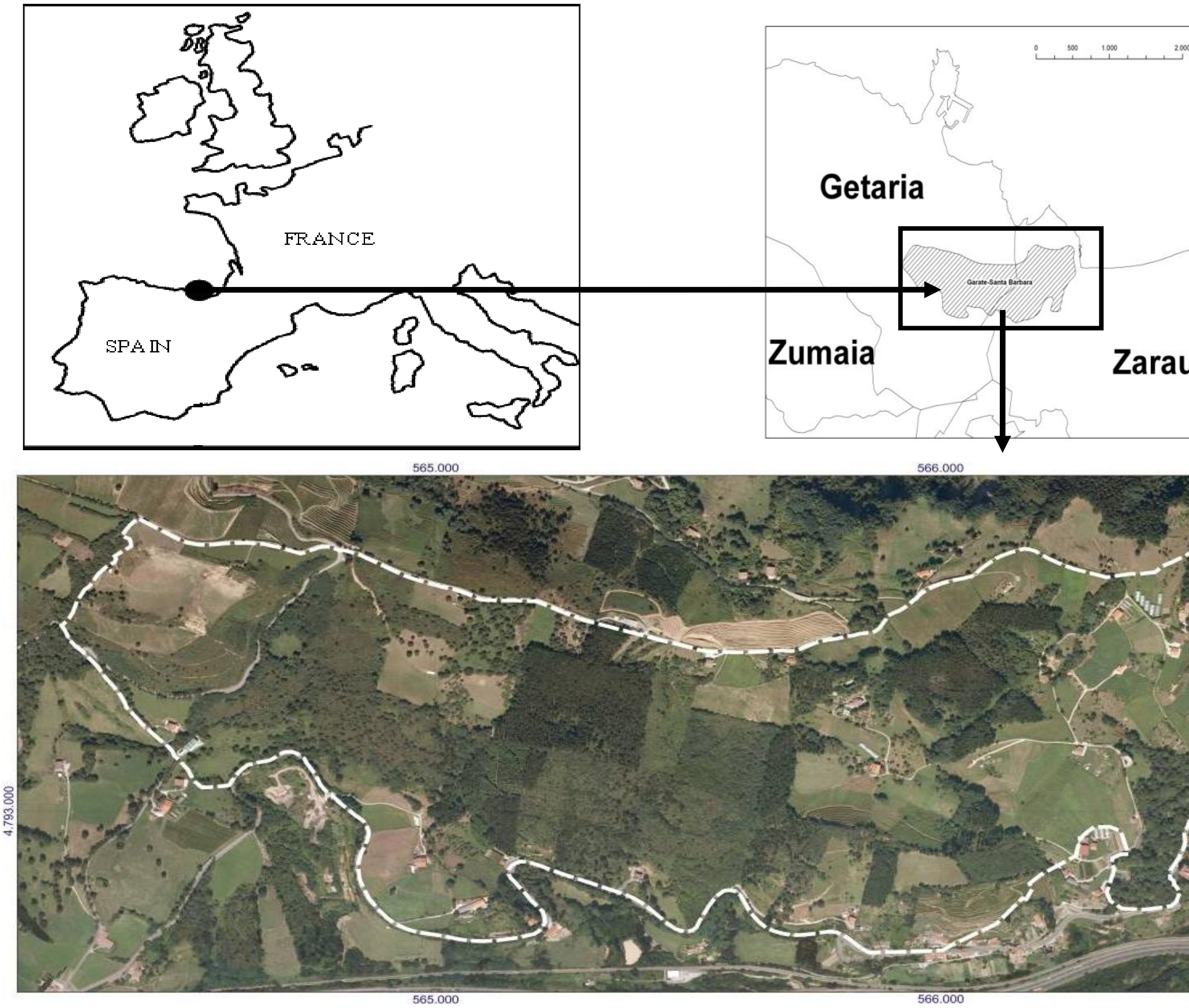

Figure 2. Location of Garate-Santa Barbara N2000 site in the province of Gipuzkoa (Basque Country)

The GSB also contains significant landscape and recreation values. Economic activities based on forestry and agriculture are also important in the area, including vineyards that produce a highly valuable sharp wine known locally as *txakoli*. Indeed, the wine sector has recently known an important growth in GSB and surrounding local area. In 1998 vineyards plantations were limited to 90 ha, in 2010 400 ha were under production of *txakoli* directly employing 77 people. In this context the main conflict arises with regard to conservation of the cork oak forests in the site which antagonises with land which could be allocated to new vineyards, as currently preferred by landowners.

The case study site illustrates the difficulties faced when dealing with the integrated management of N2000 sites where multiple interests (e.g. socio-economic, institutional and environmental) exist and multiple stakeholders represent diverse legitimate but often confronted interests and values. Indeed, taking into account these characteristics the local and regional governments showed interest in piloting a novel integrated approach in GSB to better understand the potential social, economic and environmental effects of N2000 site designations for the local and wider population in the Basque Country. Furthermore, it is believed that there is *momentum* for assessing such sites as the government of the Basque Country has taken the commitment of designating SCZ all the SCI by 2013.

4. THE PARTICIPATORY INTEGRATED ASSESSMENT PROCESS IN GSB

In order to include the diverse standpoints of the various social actors operating in the area the participatory integrated assessment process was undertaken under the SMCE framework (c.f. Figure 1). Social actors included governmental representatives at various levels: the Basque government's department of environment (regional level); Provincial government of Gipuzkoa (provincial level) and the councils of Zarautz and Getaria (local level). Other social actors that participated in the process are the local landowners (i.e., vineyard landholders, cattle ranchers, forest owners and landowners with no productive activities), the authority for the certification of the *txakoli*, farmers' unions, ecologist and other environmental NGOs, and various cultural associations operating in the area.

4.1. Setting the evaluation criteria

The information derived from the diverse views from all the social actors through various participatory fora and surveys to external experts were analysed from which eight evaluative criteria were identified. Table 1 shows the technical translation of the criteria derived from the social actors' needs and expectations.

Table 1. Selection of criteria and units of measurement for SMCE

Criteria regarding management plans		Interests / Needs / Expectations of social actors
Landscape quality	index	• Maintenance and enhancement of traditional landscape: mix of indigenous forests and grassland scattered with traditional farmhouses. • Conservation of landscape mosaic • Reclaim of abandoned (not productively active) areas • Caution about landscape alteration due to the expansion f vineyards.
Biodiversity	index	• Conservation of cork-oaks: first reason for decaling this site part of N2000 network. • Allow for the natural increase in the land under cork forests. • Conservation of other species and habitats with interest for the N2000 network, including heather land, grasslands and traditional/local forests, etc.). • Help the creation of local and regional ecological corridors • Restore degraded land areas or already negatively affected due to actual productive land uses
Recreation and cultural value	Euros	• Improving paths for hiking (need for a public trail network). • Enhance the sites and activities associated with recreation and environmental conservation. • Conservation of cultural heritage (e.g., Santiago trail, Santa Barbara church, archaeological zones, etc.). • Environmental education so that the population takes active part in environmental conservation.
Social well-being	Euros	• Higher social welfare from environmental conservation. • Protect wildlife species from human activities
Cost	Euros	• Limited resources to implement the measures. • Costs due to different actions (e.g. potential foregone economic benefits for farmers) • Explore potential ways of compensation (e.g. land purchases, etc.).
Income generation	Euros	• Economic returns from agricultural and forest related activities. • Guarantee landowners welfare levels • Social benefits due to land conservation.
Agricultural activity	ordinal	• Special support for agricultural actors in the area • Improvement of access to land for agricultural activities • Importance of agricultural activities in terms of sustainability and land management.
Acceptability	ordinal	• Degree of conflicts between social actors • Find ways to decrease potential conflicts • Use a bottom up approach in order of the population to allow the public to take management decisions

4.2. Construction of alternatives

The construction of alternative management options for the N2000 site was based on an interactive open dialogue with social actors. A workshop with the identified interest groups followed by subsequent meetings with external experts to assess the viability of preliminary management proposals provided initial information about potential management plans. The final management alternatives considered in the SMCE also relied on plausible future scenarios considering the current legal framework and the environmental potential of the area assessed by means of the bio-geographic approach. All the scenarios were translated using a geographic information system (GIS) to model the social-ecological impacts of potential land use changes in the site (Table 2).

By combining plausible land use changes with different payment schemes, alternative management options were constructed. These payment schemes consider economic compensations to landowners for promoting biodiversity. Two types of compensation schemes were devised, based on the current legal framework in the Basque Country: (1) current compensation schemes, i.e. those established by the provincial government of Gipuzkoa for the forestry sector, in particular those derived from aforestation with slow growth tree species in N2000 sites, and (2) additional compensation schemes associated with either foregone benefits due to conservation activities or with rewards to the promotion of activities that might enhance the social welfare, so-called payments for environmental services (PES). The resulting set of alternatives is summarized in Table 2.

Table 2. Scenarios and alternative land use options (surface in ha) and management options

Land use (surface in ha)	Scenario 0 Status quo	Scenario 1 Business as usual	Scenario 2 Ecological values strength *Moderate*	Scenario 3 Ecological values strength *High*	Scenario 4 Ecological values strength *Maximum*
Cork oak	16.6 (11.6%)	16.6 (11.6%)	21.1 (14.7%)	28.3 (19.8%)	51.7 (36.1%)
Other indigenous woodland	18.7 (13.1%)	18.7 (13.1%)	21.6 (15.1%)	24.4 (17.0%)	41.8 (29.2%)
Heather land	24.5 (17.1%)	24.5 (17.1%)	24.5 (17.1%)	26.5 (18.5%)	3.0 (2.1%)
Forest plantation	22.9 (16.0%)	21.3 (14.9%)	15.5 (10.8%)	3.5 (2.5%)	0.0 (0.0%)
Pasture, allotments and crops	44.4 (31.0%)	42.1 (29.4%)	44.4 (31.0%)	44.4 (31.0%)	34.1 (23.8%)
Vineyard	16.1 (11.2%)	19.9 (13.9%)	16.1 (11.2%)	16.1 (11.2%)	12.6 (8.8%)

	ALTERNATIVE MANAGEMENT OPTIONS							
Compensation schemes	A01	A11	A21 Current compensation	A22 Additional compensation	A31 Current compensation	A32 Additional compensation	A41 Current compensation	A42 Additional compensation
(1) Current compensation for foregone profit due to introduction of slow growth forest species in the forest sector (485 Euros/ha).	∅	∅	✓	∅	✓	∅	✓	∅
(2) Additional compensation (20% increase) for foregone profit due to introduction of slow growth forest species in the forest sector (582 Euros/ha).	∅	∅	∅	✓	∅	✓	∅	✓
(3) Payment for maintaining 'cork oak' woodlands (582 Euros/ha).	∅	∅	∅	✓	∅	✓	∅	✓
(4) Payment rate for maintaining 'allotments' based on agri-environmental measures (20% increase, i.e., 347 Euros/ha).	∅	∅	∅	✓	∅	✓	∅	✓
(5) Compensation for foregone profit due to decline of agricultural activities (given average profit margins of different crops and poultry).	∅	∅	∅	✓	∅	✓	∅	✓
(6) Compensation for foregone profit due to decrease in wine production (depending on average profit margins of the wine sector).	∅	∅	∅	✓	∅	✓	∅	✓

4.3. Feeding the impact matrix

Feeding the SMCE impact matrix (IM) entails the following steps (Munda, 2008): (i) selection of the indicators to assess the performance of each alternative according to the selected criteria; (ii) choice of the temporal and spatial scales in which indicators are to be measured; (iii) data collection and analysis to obtain the performance of each indicator; and (iv) evaluation of criteria.

Quantifiable indicators associated with each criterion were based on a bio-geographic assessment and an economic valuation analysis. In order to assess landscape quality and biodiversity levels, aggregated indicators were elaborated using detailed bio-geographic information. Likewise, economic valuation indicators were used to include cultural (non-use) and recreation (indirect use) values under the Total Economic Value (TEV) approach through a CE. Additional qualitative information was used to enrich the assessment to estimate other impacts, e.g. regarding the acceptability or the improvement of access to the site. Table 3 presents the IM and the criteria are described next.

Table 3. Multi-criteria Impact Matrix

CRITERIA		ALTERNATIVES							
		Status quo baseline	*Business as usual Scenario 1*	*Ecological values Strength Moderate Scenario 2*		*Ecological values Strength High Scenario 3*		*Ecological values Strength Maximum Scenario 4*	
		A01	A11	A21 Current compensation	A22 Additional compensation	A31 Current compensation	A32 Additional compensation	A41 Current compensation	A42 Additional compensation
Landscape quality	index	10,527	10,590	11,092	11,092	11,928	11,928	15,073	15,073
Biodiversity	index	199	200	218	218	247	247	345	345
Recreation and cultural value	Euros million	0	0	3.51	3.51	3.51	3.51	0	0
Social well-being	Euros million	0	1.13	17.34	17.34	30.19	30.19	145.44	145.44
Cost	Euros	0	0	3,583	29,361	9,389	36,328	11,106	67,671
Income generation	Euros	115,838	134,616	118,222	144,000	121,936	148,875	98,547	155,111
Agricultural activity	ordinal	5	6	4	2	3	1	5	4
Acceptability	ordinal	5	6	3	2	4	1	5	3

4.3.1. Landscape quality

A landscape quality value was obtained by means of a bio-geographic assessment that considered the phyto-geographic properties of the area. The methodology employed was partially based on previous frameworks and valuations (Usher, 1986), and was updated based on other case studies (e.g., Cadiñanos and Meaza, 1998a; Cadiñanos and Meaza, 1998b; Meaza et al., 2006). As a result, a conservation priority index (CPI) was obtained as a proxy for landscape quality, that combined information on phyto-geographic properties and values in the site[2].

44 new bio-geographic inventories were gathered and 23 vegetation units and plant communities were characterized and mapped in the site, for which various tasks were carried out such as locating, identifying and recording spatially explicit environmental and geographical characteristics with regard to topography, geomorphology, hydrology and soil types. CPI scores of the vegetation units identified in the site are summarized in Table 4.

Table 4. Ranking of bio-geographic conservation priority index scores

Vegetation unit	Normalized Conservation Priority Index 0-100
Cork-oak woodland	100.0
Suburban park	91.1
Aspen woodland	90.9
Oak woodland	90.9
Meadow-rushbed	87.9
Birch-oak woodland	87.8
Rushbed-boggy	82.6
Hazel woodland	74.7
Meadow fit for mowing with apple trees	70.1
Kitchen-gardens	64.4
Bramble patchs	63.8
Beechwood lands	63.1
Meadows fit for mowing	61.7
Robinia pseudoacacia woodland	60.4
Plantation of Monterrey's pines	59.5
Gorse-heath	59.3
Plantations of red oak	55.8
Oak-grove woodland	52.2
Plantation of chestnut-trees	50.4
Pastures	48.6
Plantation of Lawson's cypress	43.2
Vineyards	40.0

[2] Further information on the bio-geographic assessment can be provided upon request.

While the phyto-geographic assessment of GSB was undertaken according to vegetation units, plausible future scenarios for GSB were devised according to different land uses defined in the participatory process (c.f. Table 2). Thus, translating vegetation units into land uses was carried out as a first step before estimating the CPI for each of the scenarios (c.f. second row in Table 3).

4.3.2. Biodiversity

A biodiversity value index of flora and fauna was calculated using the bio-geographic assessment. The biodiversity of flora was assessed using two indexes: (i) a global phytocenotic interest (GPI) index and global territorial interest (GTI) index. Each of these indexes were equally weighted within the overall biodiversity index. While the GPI index comprised variables such as richness, maturity and resilience of the vegetation units identified in the site, the GTI index considered their rareness or endemicity (Cadiñanos and Meaza, 1998a; Meaza et al., 2006).

The biodiversity value of the fauna of the site was based on a zoogeographic assessment approach (see e.g., Lozano, 2001; Lozano and Meaza, 2003). This implied taking into account the number of vertebrate species detected in the vegetation units of the site divided by the maximum potential of vertebrate species. Additionally the endangered status of these species were also taken into account, based on information from the Basque Catalogue of Endangered Species (Basque Government, 1996). The number and threat status of the fauna were then equally weighted within the biodiversity index. Lastly, the biodiversity values used in the IM were calculated according to the land uses defined for each scenario (c.f. third row in Table 3).

4.3.3. Recreational and cultural values, and social welfare estimates

A CE approach was used to feed in an economic valuation expression for two of the criteria in the IM: (i) the recreational and cultural values of the site based on people’s preferences and (ii) the social welfare benefits of each of the scenarios. The theoretical basis of CE can be found in Lancaster's characteristics theory of value and random utility theory (see e.g, Ben-Akiva et al., 2009; Louviere et al., 2000; Train, 2003). The CE allowed to estimate the economic values associated with changes in land use given the scenarios identified in the participatory process (c.f. Table 2). Here we summarise the main aspects of the economic valuation approach that feeds into the IM. The technical information regarding the CE application is discussed in more details by Hoyos et al. (2011).

The CE consisted of six attributes, associated with different land uses: (i) percentage of land area covered by cork oak native woodland (levels ranging from 2% to 30%), (ii) percentage of land area covered by productive exotic pine forest plantations (levels ranging from 15% to 40%), (iii) percentage of land area covered by traditional vineyards (levels ranging from 10% to 40%), (iv) biodiversity index, based on the number of endangered species of flora and fauna (levels ranging from 5 to 25 species), and (v) the level of conservation of recreational and cultural facilities (qualitative level ranging from ''low'' to ''very high''); finally (vi) a cost attribute regarding the cost of a hypothetical conservation programme (ranging from 0 to 100 Euros *per capita*) was also included. The attributes were selected based on focus groups in the GSB, bio-geographic analysis of the area and external expert advice by key informants (government technicians and researchers).

A main effects fractional factorial design with second order interactions was used to simplify the construction of choice sets (Louviere et al., 2000). The final version of the questionnaire had two choice sets, each formed by the *status quo* option plus two alternative scenarios previously designed through GIS for the N2000 site (c.f. Table 2). The complexity of the choice task was satisfactorily pre-tested in focus groups and through pilot surveys.

The survey was administered through in-person computer-aided individual home interviews. The relevant population considered was that of the Basque Country, accounting for 1.8 million people aged of 18 years old or older. A stratified random sample of 400 individuals was selected from the relevant population. The stratification variables included age, gender and size of the town of residence, following official statistical information by the Basque Statistic Office (EUSTAT). In each of the locations in the Basque Country (32 cities or villages all across the region), the questionnaire was distributed using random survey routes. The data analysis used 221 completed questionnaires, yielding 1,326 observations, as each respondent faced six choice sets[3].

A mixed-logit model specification was used to approximate the discrete choice model derived from random utility maximisation (c.f. Table 5). Two parameters were identified to be random and tested to follow a lognormal distribution: indigenous woodland and biodiversity. As expected, the negative coefficient of the payment attribute indicates that the probability of accepting an annual payment for the protection of the N2000 site decreases as the size of the payment increases. Utility also increases when the land covered by the indigenous non-productive woodland (i.e., cork oak woodland, oak woodland) increases and when the level of biodiversity conservation increases[4]. The positive coefficient associated with the recreation and cultural facilities attribute suggests that utility increases if the quality of recreation facilities improves. Similarly, although to a lesser extent, utility increases when if the area covered by vineyards is increased. Interestingly, against expectations, the coefficients associated with (productive) pine forest plantation is negative and statistically significant, indicating that the utility of individuals decreases when the land covered by forest plantations in the site increases. Observed heterogeneity was also incorporated in this model specification by interacting certain socio-demographic characteristics of the individuals (high income, Basque cultural identity, having children, liking conifer plantations, visitors and climbers) with some of the previous attributes.

[3] The rest of the questionnaires were discarded, either because respondents failed to enter into the market (protest respondents) or because they failed to pass a rationality test (see Hoyos et al., 2011).
[4] The interpretation of these coefficients is not straightforward as they are parameters of a lognormal distribution.

Table 5. Mixed-logit model and willingness to pay (WTP) estimates (in Euros 2008 per person-year)

year)

Attributes	coefficient	t-ratio	Mean WTP	WTP interval (min, max)
Constant	-0.05338	-0.18		
Indigenous woodland	-3.49054	-10.77	2.55	(1.40, 6.08)
Pine forest plantation	-0.02062	-2.42	0.66	(-2.34, 1.94)
Vineyards	0.01622	2.50	0.50	(-0.44, 1.84)
Biodiversity	-3.76038	-6.55	1.39	(1.13, 2,57)
Recreation	-0.02510	-0.73	1.98	(0.00, 3.32)
Cost	-0.02214	-10.18		
Hincome*Cost	0.01334	2.29		
Identity*Indigenous woodland	0.02030	1.80		
Identity*Vineyards	-0.02594	-2.41		
Children*Biodiversity	-0.01797	-1.92		
Conifer*Pine forest plantation	0.02251	2.72		
Visitor*Recreation	0.03246	1.80		
Climber*Recreation	0.06934	2.03		
Std. Dev. Indigenous woodland	1.25407	3.21		
Std. Dev. Biodiversity	1.43062	2.96		
Log-likelihood	-1177.09			
Pseudo R2	0.19			
Observations	1326			
Sample size	221			

Source: Hoyos et al. (2011)

[TABLE 5]

Based on the results from the CE a compensating surplus welfare measures were simulated (c.f. Table 5) following Hanemann (1984) and Train (1998):

$$CS = -\frac{1}{\alpha}\left[\ln\left(\sum \exp(\beta X_{ij}^{0}\right) - \ln\left(\sum \exp(\beta X_{ij}^{1}\right)\right]$$

where α is the marginal utility of income (usually represented by the coefficient of the payment attribute), and X_{ij}^{0} and X_{ij}^{1} represent the vector of environmental attributes at initial level (*status* *quo*) and after the change levels, respectively. The simulated willingness to pay (WTP) was estimated taking into account both the observed and unobserved heterogeneity.

As shown in Table 5, the mean annual WTP for a one percent increase in the land area covered by attributes is estimated at (Euros per person, in 2008 values): indigenous woodland, 2.55 Euros; pine forest plantation, 0.66 Euros; and vineyards, 0.50 Euros. Biodiversity has been excluded from social well-being estimates to avoid double counting as it has been already considered as a criterion (section 4.3.2). The mean annual WTP to improve the recreation and cultural facilities of the site is estimated at 1.98 Euros per person.

Table 6 shows the change in the TEV under the different scenarios taking into account the sample of the population of the Basque Country for ‘‘recreational and cultural values’’ and as well as due to increasing "social well-being" due to conservation in GSB. It can be seen that the highest social welfare expressed in monetary terms is associated with the highest ecological value strength scenario (i.e., scenario 4) for the N2000 site.

Table 6. Change in economic value under four different scenarios per year for the entire population of the Basque Country (in Euros million, 2008)

Criteria	Scenarios[1]			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Change in recreation and cultural value	0	3.51	3.51	0
Change in social well-being	1.13	17.34	30.19	145.44

Note (1): the scenarios have been defined depending on land use changes from status quo (baseline). See Table 2. In scenarios 2 and 3 there is an increase of the level of recreation and cultural facilities.

4.3.4. Cost of protection programme

The cost associated with the compensation scheme for the protection of the N2000 site is another criterion used in the SMCE. Compensation schemes have only been considered for the management options in which ecological values are improved (i.e. A21, A22, A31, A32, A41, and A42). The following values were estimated for each alternative (c.f. Table 2) based on the Basque legislation regarding the forestry sector and agri-environmental measures: (i) Current compensation for foregone profit due to introduction of slow growth tree species (485 Euros/ha); (ii) additional compensation (20% increase) due to foregone profit associated with the introduction of slow growth tree species (582 Euros/ha); (iii) compensation for maintaining cork oak woodlands (582 Euros/ha); (iv) payment for the maintenance of allotments as an agri-environmental measure (347 Euros/ha); (v) compensation for foregone profit due to the decline of agricultural activities (based on estimates from average profit margins of different crops and poultry); and (vi) compensation for foregone profit due to decrease in *txakoli* wine production (depending on average profit margins of the wine sector). The sums of these values for each alternative were introduced in the IM (c.f. sixth row in Table 3).

4.3.5. Income generation

The assessment of this criterion considered income generated by local agricultural activities, including forestry activities and the production of *txakoli* by the local traditional wineries. Payments derived from compensation schemes were included alongside average gross margins for the agricultural activities. Profit margins associated with each alternative management option were calculated and extrapolated according to the land cover of crops and activities in each of the alternatives (Table 7). These figures were introduced in the IM (c.f. seventh row in Table 3).

Table 7. Income generation in each alternative management option (in Euros)

Description	Alternative management options							
	Scenario 0	Scenario 1	Scenario 2		Scenario 3		Scenario 4	
	A01	A11	A21 Current compensation	A22 Additional compensation	A31 Current compensation	A32 Additional compensation	A41 Current compensation	A42 Additional compensation
Crops and poultry income	27,088	25,680	27,088	27,088	27,088	27,088	20,839	20,839
Compensation for pasture, allotments and crops	0	0	0	15,406	0	15,406	0	21,656
(a) Total crops and poultry income	27,088	25,680	27,088	42,494	27,088	42,494	20,839	42,494
Wine sector income	85,031	105,469	85,031	85,031	85,031	85,031	66,602	66,602
Compensation for vineyards	0	0	0	0	0	0	0	18,429
(b) Total wine sector income	85,031	105,469	85,031	85,031	85,031	85,031	66,602	85,031
Forest sector income	3,719	3,467	2,519	2,519	428	428	0	0
Compensation for forest plantations	0	0	3,583	4,300	9,389	11,266	11,106	13,327
(c) Total forest income	3,719	3,467	6,102	6,819	9,817	11,694	11,106	13,327
(d) Compensation for cork oaks	0	0	0	9,655	0	9,655	0	14,259
Total Income generation	115,838	134,616	118,222	144,000	121,936	148,875	98,547	155,111

Note: Total Income generation is the sum of (a), (b), (c) and (d) items.

4.3.6. Maintenance of agricultural activities

This criterion was assessed taking into account three indicators that were identified as the most relevant in the deliberative process among the social actors and the research team (c.f. Table 1): (i) support for traditional farming activities, proxied by the total amount of aid received by the agricultural sector in the N2000 site (in Euros); (ii) improvement of access road and infrastructure for farmers and local citizens in the N2000 site, in qualitative terms; (iii) viability of local land management, measured according to the land cover (in hectares) associated with land use for ‘‘commercialised agricultural products’’, whereby the larger the land cover under this land use, the greater the viability of local land management. The score of these three variables shown in Table 8 were combined using a multi-criteria algorithm to reach an ordinal ranking of alternatives according to these criteria (c.f. eighth row in Table 3).

Table 8. Impact matrix for maintenance of agricultural activity

Criteria	Alternatives[1]							
	A01	A11	A21	A22	A31	A32	A41	A42
Sector support (Euros)	0	0	3,583	29,361	9,389	36,328	11,106	67,671
Approach roads fitting-out	low	low	medium	medium	medium	medium	low	low
Activity importance in terms of sustainability and land management (ha)	44.40	42.09	44.40	44.40	44.40	44.40	34.15	34.15

Note (1): the alternatives have been defined depending on the land use changes from status quo (baseline) and the nature of compensation schemes. See Table 2.

4.3.7. Social acceptability

The scores associated with this criterion were based on a conflict analysis carried at the end of the evaluation process. By mapping winners and losers and making explicit the trade-offs between different interests, this analysis provided rich information in the search for compromise solutions. In order to structure the dialogue between the affected parties and assist in the search for shared goals, an analysis of potential coalitions by means of an eclectic approach based on concepts coming from land use planning, fuzzy cluster analysis and social choice was developed (see e.g., Munda, 1995, 2008; Paneque et al., 2009). Within this framework the first step involved developing an equity matrix, where the positions of actors regarding the alternatives were explicitly reflected. Social actors were asked about their level of preference according to a nine-options scale ranging from ‘‘extremely bad or total rejection’’ to ‘‘extremely good or total acceptance’’ of the alternatives (Table 9).

Table 9. Equity matrix

Actors[1] code	Actors	Alternatives[1,2]							
		A01	A11	A21	A22	A31	A32	A41	A42
G1	Basque Government's Department of Environment	2	1	7	7	9	8	9	7
G2	Provincial Government of Gipuzkoa	2	1	7	7	9	8	9	7
G3	Council of Zarautz	2	1	7	8	8	9	7	8
G4	Council of Getaria	4	4	7	8	8	9	6	7
G5	Vineyard landholders	5	9	5	5	5	5	1	4
G6	Cattle ranchers	6	4	6	8	6	8	1	7
G7	Pine forest landowners	4	3	3	7	2	8	1	9
G8	Landowners with no productive use	6	6	5	7	4	8	3	9
G9	Organisation that certifies the "Txakoli de Getaria"	7	9	6	6	6	6	2	2
G10	Farmer unions	5	7	5	8	5	8	2	5
G11	Ecologist/conservationist groups	3	1	6	8	7	8	8	9
G12	Local cultural organisations	6	5	8	8	8	8	7	7
G13	Basque population[3]	5	2	7	7	8	8	9	9
G14	Zarautz-Getaria population[3]	5	2	8	8	8	8	6	6

Note (1): 1: extremely bad; 2: very bad; 3: bad; 4: more or less bad; 5: neither good nor bad; 6:more or less good; 7:good; 8:very good; 9:extremely good.
Note (2): the alternatives were defined depending on the land use changes from the status quo (baseline) and the nature of compensation schemes (see Table 2).
Note (3): information collected from the CE questionnaire.

After a sequence of mathematical reductions, the NAIADE (Novel Approach to Imprecise Decision Environment) outranking method (see Munda, 1995; JRC-EC, 1996) was applied to build a *dendogram* of coalition formation. NAIADE is a discrete multi-criteria method based on the partial comparability axiom which features mixed information types and conflict analysis. Figure 3 illustrates the potential coalitions and the degree of credibility of their occurrence (the number on the left in Figure 3) and Table 10 shows the potential coalition with a 0.7 degree of credibility[5] and the ranking of alternatives of each coalition (from the more desirable in the top to the less desirable ones at the bottom). Interestingly it should be noted that three alternatives, i.e. *status quo* (A01), *business as usual* (A11), and moderate strength of ecological values with current compensation schemes (A21), are vetoed by a main coalition of social actors (i.e., Basque government's department of environment, provincial government of Gipuzkoa, councils of Zarautz and Getaria, ecologist/conservationist groups, and local and Basque population) (see first column in Table 10). The validity process was undertaken in a final workshop (c.f. Figure 1), where these results were presented and discussed with the social actors.

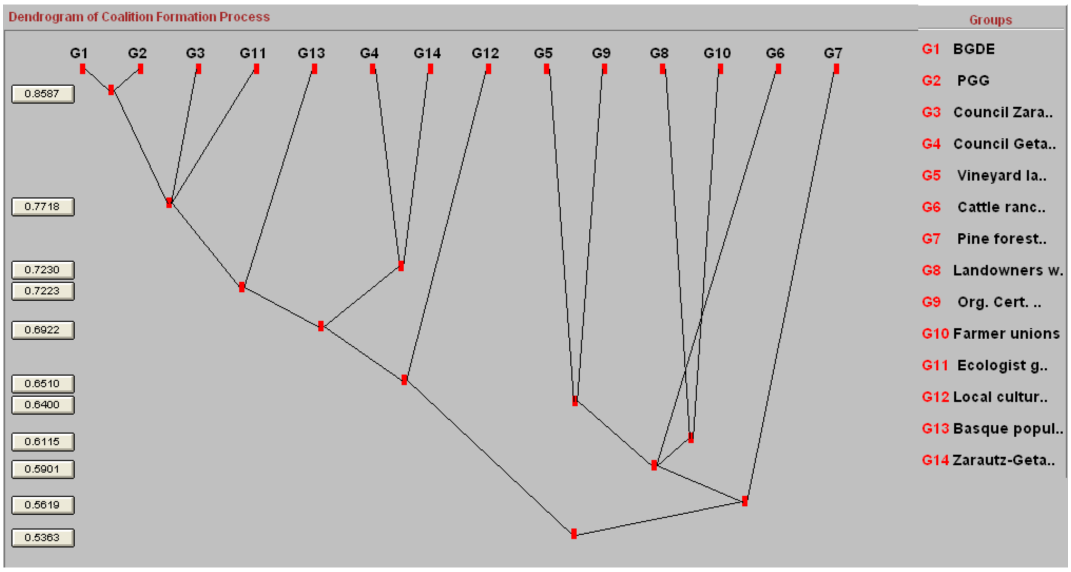

Figure 3. Dendogram of coalition formation process

[5] According to different empirical studies a 0.7 degree of credibility is rather high (see e.g., Gamboa and Munda, 2007; Garmendia, Gamboa et al., 2010).

Table 10. Ranking of alternatives for potential groups of social actors[1,2]

{G1, G2, G3, G4, G11, G13, G14}		{G7}		{G12}		{G6}		{G9}		{G5}		{G10}		{G8}	
A32	0.10	A42	0.00	A22	0.03	A22	0.03	**A11**	0.00	**A11**	0.00	A22	0.03	A42	0.00
A31	0.22	A32	0.05	**A21**	0.03	A32	0.03	**A01**	0.20	**A21**	0.50	A32	0.03	A32	0.05
A22	0.36	A22	0.20	A31	0.03	A42	0.16	**A21**	0.30	**A01**	0.50	**A11**	0.16	A22	0.20
A42	0.44	**A01**	0.20	A41	0.16	A31	0.27	A22	0.30	A22	0.50	A31	0.45	**A01**	0.30
A41	0.45	**A11**	0.80	A32	0.16	**A01**	0.27	A31	0.30	A31	0.50	**A01**	0.45	**A11**	0.30
A21	0.54	**A21**	0.80	A42	0.16	**A21**	0.27	A32	0.30	A32	0.50	A42	0.45	**A21**	0.50
A01	2.08	A31	0.95	**A01**	0.27	**A11**	0.67	A42	0.95	A42	0.70	**A21**	0.45	A31	0.70
A11	2.50	A41	1.00	**A11**	0.45	A41	0.95	A41	0.95	A41	1.00	A41	0.91	A41	0.80

Note (1): Veto diagram for level 0.6922. Alternatives A21, A01, and A11 are vetoed (in bold) by social actors G1, G2, G3, G4, G11, G13, and G14.
Note (2): G1: Basque Government's Department of Environment; G2: Provincial Government of Gipuzkoa; G3: Council of Zarautz; G4: Council of Getaria; G5: Vineyard landholderds; G6: Cattle ranchers; G7: Pine forest landowners; G8: Landowners with no productive use; G9: Organisation that certifies the "Txakoli de Getaria"; G10: Farmers unions; G11: Ecologist/conservationist groups; G12: Local cultural organisations; G13: Basque population; G14: Zarautz-Getaria population.

Derived from this analysis and according to the level of acceptance/rejection of each alternative (number of actors in favour or against each alternative) an ordinal ranking of alternatives was obtained for feeding the IM (c.f. ninth row in Table 3).

5. RESULTS

The ranking of alternatives is influenced by different factors of the evaluation process, e.g., the criteria or indicators selected, quality of information and data used, or the criteria aggregation method employed (mathematical model). Hence the technical result of the multi-criteria analysis (i.e., ranking of alternatives) will depend on the problem structuring process and its outcomes (Gamboa, 2006). Thus, participation of social actors is a key factor for the quality control of the whole evaluation process.

The technical evaluation was undertaken by means of the NAIADE outranking method. Here NAIADE is used because (i) it considers intensity of preference by means of preference and indifference thresholds[6], (ii) it allows to manage the degree of compensation in the criteria

[6] The preference threshold is the minimum difference between the performances of two alternatives in one criterion that makes one option preferred instead of the other. The indifference threshold is the maximum

aggregation procedure (which allows to do sensitivity analysis), and (iii) it deals with mixed information (qualitative and quantitative). The aggregation procedure of NAIADE in operational terms is carried out in three stages (see Garmendia, Gamboa et al., 2010). First, a pair-wise comparison of alternatives by means of preference relationship (preference and indifference thresholds has to be defined for this task) is conducted. This requires the calculation of preference intensity indexes, which indicate how much better or worse one alternative is in respect to another. NAIADE calculates the number of criteria in favour of one alternative with respect to another and the intensity of preference. Secondly, an aggregation of preference intensity indexes and the "ϕ^+ and ϕ^- indexes" are calculated, where these indexes inform the extent to which one alternative is better or worse than all other alternatives, respectively. Thirdly, the ranking of alternatives based on the comparison of ϕ^+ and ϕ^- is obtained.

5.1. Ranking of land use and management alternatives

The application of the mathematical algorithm makes possible the evaluation of the overall performance of each alternative management option according to the selected set of criteria. This ranking is shown in Figure 4.

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difference between the criterion scores of two alternatives that makes no difference between them (under that criterion).

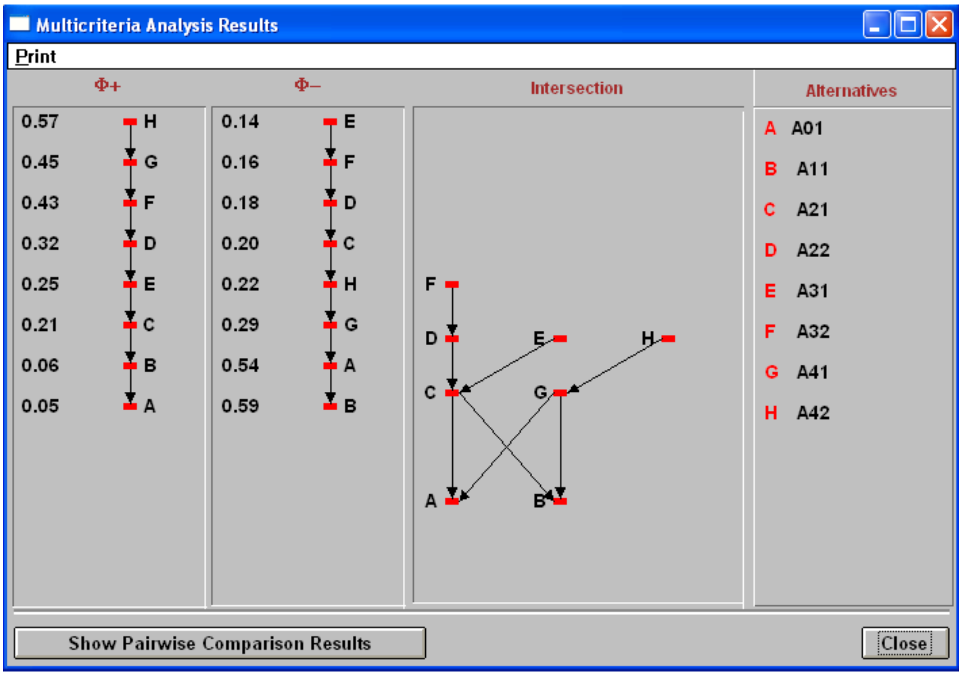

Figure 4. Ranking of alternatives

The land use option associated with a significant increase of the land cover under cork oak woodland along with the implementation of additional compensation schemes, i.e., alternative A32 (F), obtains the highest valuation in global terms (see third column 'intersection' in Figure 4 for alphabetical lettering). The second position in the ranking (*second best*) is the alternative A42 (H), which strengths most ecological values due to a great increase of indigenous woodland and considers additional compensation schemes. While this alternative shows better results than alternative A32 (F) regarding the biodiversity, landscape quality and income generation criteria, it had a lower level of acceptance among social actors (c.f. ninth row in Table 3). Alternatives A22 (D) and A31 (E) also obtain better results compared to the rest of the alternatives but they are still outperformed by A32 (F), except for the cost criterion. The rest of the alternatives which are associated with current compensation schemes, i.e., A21 (C) and A41 (G), are outranked globally worse due to either a relatively low performance in terms of biodiversity and maintenance of agricultural activity or due to having a low score in terms of income generation and the overall level of acceptance of the management option, respectively. The least favoured alternatives are A01 (A) and A11 (B) since their impacts in terms of biodiversity, landscape quality, maintenance of agricultural activities, increase in social well-being and acceptability are relatively low.

5.2. Conflict analysis

Distributional issues are a key question to be considered in the formulation of sound decision making process and effective management of PAs (Paavola, 2004). For the success of the European N2000 network the inclusion of all the counterparts in the decision making process appears to be of key importance.

A conflict analysis can enhance bridges between social actors with confronted interest through a social learning process (Garmendia and Stagl, 2010). In this case, in contrast to what it was expected at the beginning of the process, we find it possible to build compromises among the majority of the social actors. The conflict analysis reveals that any of the two alternatives associated with the increase of cork oak woodland (A22, A32) followed by a rather modest compensation scheme (between 29,000 and 36,000 Euros per year, see sixth row in Table 3) would be enough for establishing a collective agreement among the majority of the social actors (c.f. Table 10). Nevertheless, protection levels that significantly exceed the area of non-productive forest and other marginal lands (i.e., A41 and A42) might raise greater opposition due to interests derived from traditional agricultural activities or the commercial use of vineyards. The least favoured alternatives by the majority of social actors are A01 and A11.

5.3. Sensitivity analysis

A sensitivity analysis is an important feature of any multi-criteria evaluation process to test the robustness of the results (Saltelli et al., 2000; Proctor and Drechsler, 2006). In this case, variations in the parameter that determine the degree of compensation and credibility within the mathematical algorithm were considered and the results were found stable under such variations which corroborates the robustness of the results, i.e., A32 is ranked first in most cases followed by A22 and A31[7].

6. DISCUSSION AND CONCLUSIONS

The main properties of a SMCE framework, i.e. social learning tool, transparency, inclusiveness with regard to social actors and scientific disciplines, and the flexibility to adapt to a changing environment regarding the emergence of new values and knowledge, can be enriched when combined with other valuation tools. Using a case study of a N2000 network site in the Basque Country, a social multi-criteria analysis tool has allowed the integration of a participatory process and the inclusion of economic values through a CE valuation approach and a bio-geographic assessment.

The implementation and management of PAs usually creates conflicts of interests, often due to top-down and technocratic decisions that tend to neglect the diversity of interests in society, especially regarding those of local communities affected by such conservation measures (Paavola et al., 2009; Visser et al., 2007). In contrast to such "fence and forget" approach, involving local communities in conservation policies that support their livelihoods increases the acceptability and legitimacy of such policies (Bergseng and Vatn, 2009), in addition to develop social capital, trust and reciprocity among social actors (Beunen and de Vries, 2011).

The integrated assessment framework applied to the case of a N2000 network site in the South of Europe demonstrates the possibility to make operative the idea of an ''orchestration of sciences'' (Neurath, 1973). We have shown how the combination of the SMCE and a CE valuation method can overcome some of the main weaknesses attributed to multi-criteria analysis tools (e.g., Ciani et al., 1993; van Pelt et al., 1990), by having a multiple languages of valuation (Pascual et al., 2010) and enhancing the representativeness of society through a participatory approach. Additionally the fusion of different types of information, based on key informant data through qualitative in-depth interviews, workshops, focus groups, etc., and on a structured survey involving over 400 individuals

[7] Further information on the sensitivity analysis can be provided upon request.

to uncover their preferences towards alternative conservation strategies demonstrates the flexibility of the evaluation approach proposed.

The case study of the GSB N2000 in the Basque Country demonstrates that it is possible to enhance the ecological value of a PA by increased biodiversity conservation while, at the same time, maintaining other social-ecological benefits for its inhabitants. The latter in this case includes *inter alia* enhancing recreational values, additional support to farmers or improving the accesses to the local inhabitants.

It has been argued that as the environment is characterized by the existence of multiple legitimate but frequently confronted interests (Martínez-Alier et al., 1998; Limburg et al., 2002), and therefore given the unavoidable presence of social incommensurability (Munda, 2004) the inclusion of all the counterparts is a key prerequisite to guaranty a sound management decision in N2000 network. We find that, against expectations, there is predisposition by local social actors for a land use transition towards a more sustainable scenario that would enhance the environmental values of the N2000 site. Such result should be understood not as if guiding an optimal management solution, but as the potential to find a workable compromise solution among the involved actors (De Marchi et al., 2000; Gamboa, 2006).

As one of the civil servants representing the local government argues during the participatory process, *"the close interaction among all the participants during the process has created a great 'social capital' needed to keep working among all the counterparts beyond this research process"*. This in line with the constructive or creative approach suggested by Roy (1985) in which finding a final solution in a decision problem is less a discovery than a creation, and the actors taking part in the decision process have the opportunity to either shape, argue and/or transform their preferences. In fact, the usefulness of the assessment process must be emphasized as a mean to generate a social learning process that improves the policy-making quality (Garmendia and Stagl, 2010).

Following Wegner and Pascual (2011) we illustrate how a holistic evaluation approach can contribute to overcome unnecessary conflicts and settle a socially robust basis to design effective and equitable policies for land use planning and management in PAs. For doing so, it is necessary to strengthen conservation interests with the social support and legitimacy that can be derived from the active involvement of all the counterparts in a decision making process.

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