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Nekane Castillo-Eguskitza[a*], David Hoyos[b,c,] Miren Onaindia[a], Mikolaj Czajkowski[d,e]

[a] Plant Biology and Ecology Department, Faculty of Science and Technology, University of the Basque Country UPV/EHU, Barrio Sarriena s/n, 48940 Leioa, Biscay, Spain
[b] Department of Applied Economics III, University of the Basque Country UPV/EHU, Faculty of Economics and Business, Bilbao, Spain
[c] EKOPOL, Research Group on Ecological Economics and Political Ecology, University of the Basque Country UPV/EHU, Bilbao, Spain
[d] Faculty of Economic Sciences, University of Warsaw
[e] Charles University, Environmental Center, Prague, Czech Republic
** Corresponding author: nekane.castillo@ehu.eus*

Abstract: Economic valuation of ecosystem services has emerged as a valuable tool to promote conservation and sustainable land management. Our study adds to this literature, by reporting the results of a discrete choice experiment used to analyse local population preferences and willingness-to-pay for selected ecosystem services resulting from different management scenarios in the Urdaibai Biosphere Reserve (Biscay, Spain). The ecosystem services considered include quality of water bodies, agricultural production, native forest protection, biodiversity, and recreation. The results indicate that the local population is willing to financially support a new management plan focused on the improvement of ecosystem health and landscape multifunctionality and sustainability, with recreation being the least valued ecosystem service. These findings may be used to inform conservation and management policies to maximize social well-being. They can also help to prioritize investments and allocation of funding and hence minimise land use conflicts.

Keywords: Ecosystem services, discrete choice experiment, social preferences, economic valuation, Urdaibai Biosphere Reserve

JEL codes: Q51, Q15, Q24, Q25, Q26, Q28, Q57, Q58

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1. Introduction

The current ecological and social-economic impacts of environmental degradation have clearly changed the global point of view about nature and human well-being (MA, 2005). At present, rather than the mere act of conserving biodiversity, the need to incorporate the concept of ecosystem services (ES) in land management is being claimed as necessary if sustainable development is to be achieved. The ES framework contributes to the understanding of the relationship between ecosystems and human well-being by integrating the ecological, economic, and socio-cultural dimensions of ecosystems (Haines-Young & Potschin, 2010; Martín-López et al., 2014). Thus, valuing ES and incorporating these values in decision-making may be fundamental for ensuring sustainable conservation policies. However, their application in policy is limited and uncertain.

One of the main limitations for this approach is that while the costs of biodiversity conservation are clear, the benefits provided by ecosystems are usually hidden or unnoticed due to the lack of markets (Costanza et al., 1997; de Groot et al., 2010). In response, economic valuation of ES is increasingly being used as a tool to make the benefits of ES visible and underpins informed decisions to safeguard biodiversity (TEEB, 2010; Costanza et al., 2014; Hansjürgens et al., 2017; Hanley and Czajkowski, 2017). Economic valuation is a powerful tool to demonstrate the importance of nature and the need to invest in green infrastructure, including protected areas, and to achieve desirable levels of ES supply according to the demands of the society (Tagliafierro et al., 2013; Bernués et al., 2015).

ES are provided by the ecosystems (supply-side), and at the same time, their provision is altered by social-systems management, resulting from the needs and desires of human societies (demand-side). Thus, for successful and efficient environmental management, both the ecosystems and societies need to be considered. As a result, the challenge for policymakers has also expanded to understanding human preferences for the environment (Rode et al., 2016; Pascual et al., 2017). In fact, as Oldekop et al. (2015) suggested, conservation targets are more likely to be achieved when socioeconomic benefits are encouraged through sustainability rather than when they are imposed through strict protection.

One of the most prominent non-market valuation methods is the discrete choice experiment (DCE) technique, which allows evaluation of social preferences for quantifiable changes in various environmental attributes (Hanley et al., 2001, Carson and Czajkowski, 2004). The DCE methodology involves respondents' choices in a hypothetical market so that the values of the attributes being analysed can be inferred from trade-offs that people make among the different alternatives (Louviere et al., 2000; Hoyos, 2010). Since the DCE was first developed in the early 1980s (Louviere and Woodworth, 1983), the literature on this topic has grown rapidly and it has gained much popularity in environmental valuation studies, including ES (Christie et al., 2015; Chaikaew et al., 2017), landscape and land use management (Deng et al., 2016; Häfner et al., 2018) and the design of landowners' contracts to improve the provision of ES (Vedel et al., 2015; Górriz-Mifsud et al., 2016; Hasler et al., forthcoming). Precisely, because of their significance to conserve biodiversity, and consequently ES, DCE studies are frequent in protected areas (Börger et al., 2014; Mueller et al., 2017; Xuan et al., 2017; Valasiuk et al., 2018).

In this study, we implement a DCE method to value selected management schemes and the associated ES changes in the Urdaibai Biosphere Reserve (UBR) in northern Spain. Currently, the abandonment of agriculture and intensification of forestry and industry are threatening the delivery of ES in this area (Rescia et al., 2010; Onaindia et al., 2013a). Our results provide an overview of public preferences for various land use options and allow estimating the monetary value of the associated ES changes. The results are, therefore, highly policy-relevant for this area, especially considering that biosphere reserves promote the involvement of local communities in their management to reconcile nature conservation and sustainable development (UNESCO, 2016). Overall, our findings allow for a more successful and efficient land use policy that ensures equitable and sustainable land management to maximize social benefits.

2. Data and methods

2.1. Study area

The UBR is located in the Basque province of Biscay, Spain (Fig. 1). It has an area of approximately 220 km^2, and it is organized administratively into 22 municipalities, clearly distinguishing an urban area (Bermeo-Gernika), which hosts nearly 75% of the inhabitants and most of the industrial activity and services, and a rural area, with a very low population density. The UBR represents a complex social-ecological system, i.e., a human-natural system shaped over time because of the existing interrelationships between ecosystems and human activities (Liu et al., 2007) where contrary interests coexist. As a result, its management turns out to be fraught with conflict and controversy (Onaindia et al., 2013b).

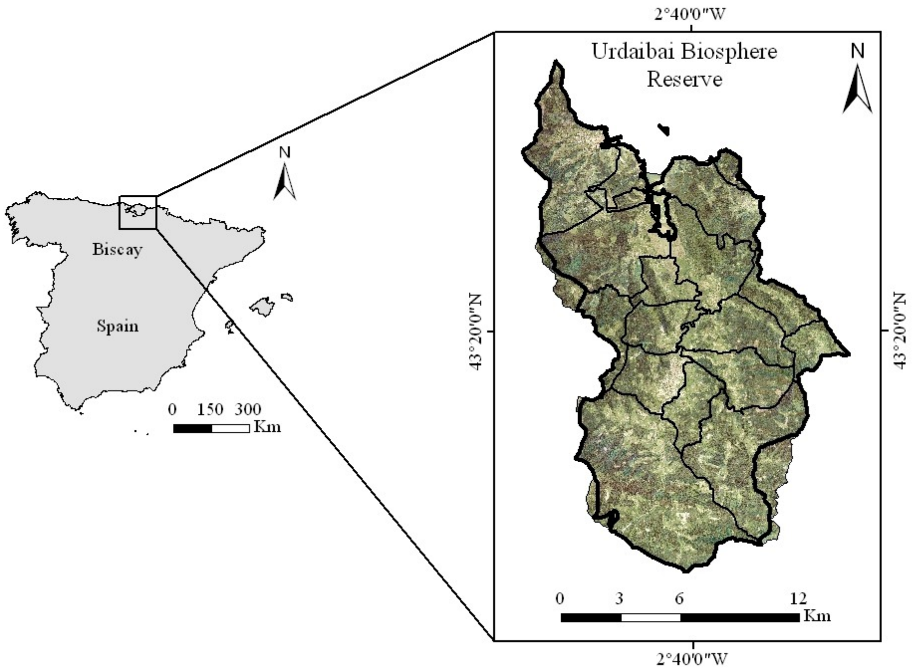

Fig. 1. Study area (only municipalities containing more than a third of their area in the Urdaibai Biosphere Reserve, black boundary, were included)

In 1984, this area was declared a reserve to protect its highly ecologically valuable coastal ecosystems, marshlands, and the Cantabrian holm oak habitats. Later, in 1989, special legislation was established to protect the integrity and promote the recovery of the natural ecosystems, and in 1993, a Governance Plan for Use and Management was approved, and now reviewed (BOPV, 2016). The estuary is the central area of the UBR, and it encompasses the most extensive coastal area and best-preserved salt marshes in the region. Nonetheless, throughout the last century industrial activities (metallurgy, shipyards, dies, or cutlery), harbour activities, and inefficient sewage disposal have compromised the original unpolluted state of UBR (Puy-Azurmendi et al., 2013; de los Ríos et al., 2016). According to the criteria established by the Water Framework Directive, the global state of the transitional waters is considered bad (AZTI-Tecnalia, 2016) and the largest aquifer in the UBR was diagnosed to be in a poor chemical state (Agencia Vasca del Agua, 2016). Frequent boat launching from the shipyard has affected hydrodynamics of the estuary, limiting the possibilities for recreational activities, such as surfing, fishing and bird watching (Monge-Ganuzas, 2013).

Further, the nearly total predominance of exotic plantations of *Pinus radiata* and *Eucalyptus sp.* at the expense of native forests and agricultural land has led to multiple conflicts between nature conservation and economic development. The unsustainable management of these plantations, including clear-cutting, mono-culturalism and the use of heavy machinery brings about erosion, worsening of water quality, decreased freshwater supplies, and a loss of aesthetic values (Onaindia et al., 2013a; Rodríguez-Loinaz et al., 2013). Meanwhile, the decline of the traditional "caserío," based on a mixed production of horticulture, cattle, and forestry, has also implied a reduction in local food production, together with a loss of cultural identity and traditional knowledge (Agnoletti, 2014).

2.2. Discrete choice experiment

Designing a DCE involves the selection and combination of the attributes and attribute levels used to construct the alternatives included in the hypothetical choice situations presented to respondents (Hoyos, 2010). The identification of the ES and land use-related attributes was facilitated by a biophysical literature review and an interest ranking of ES, which was previously conducted in the study area (Castillo-Eguskitza et al., 2018). According to the latter, food from agriculture, climate and air regulation, water regulation and purification, and habitat for species were the most important ES for respondents' well-being, whereas timber, tourism, and recreation were some of the least important (Castillo-Eguskitza et al., 2018). Based on these results, we selected the attributes, and considering sustainability as the main goal of the biosphere reserve, we consulted experts to assign quantitative levels of these attributes, that reflect possible changes associated with introducing various policy interventions. In line with the state-of-the-art recommendations for stated preference studies (e.g., Johnston et al., 2017, Champ et al., 2017), the design of our study involved qualitative pretesting in the form of a focus group with local stakeholders from the UBR area. The qualitative pretesting confirmed the suitability of the survey design and ensured the relevance and understanding of the attributes.

Table 1 shows the ES and land use attributes and their levels used in the DCE. In total, we selected six attributes: 1) organic farming, represented by the percentage of new areas with good agricultural practices in the UBR; 2) biodiversity protection, measured by the number of endangered species of flora and fauna within the Basque Catalogue of Threatened Species with management plans; 3) the quality of water bodies, based on the classification according to the European Union Water Framework Directive; 4) the native forest area, represented by the area of pine and eucalyptus plantations substituted with native broadleaf forests; 5) recreational possibilities, based on the state of maintenance of paths and recreational areas and 6) a monetary attribute (cost), specified as an annual income tax for all Basque citizens over the next 10 years, to be allocated to a foundation exclusively dedicated to protecting the UBR. Each ES and land use attribute was described using three different levels: the current situation and two levels associated with implementing various new management scenarios, whereas the monetary attribute represented six levels ranging from 0 to 100 EUR per capita per year.

Table 1. Attributes, attribute levels, and the associated ecosystem services

Attributes	Levels	Associated ecosystem services
Organic farming	0.5%*, 2%, 5% of the area	Provisioning: Food Regulating: Erosion control, nutrient regulation, pollination, biological control, habitat for species Cultural: Traditional knowledge, ecotourism, aesthetic enjoyment
Biodiversity protection	5*, 15, 25 species protected	Regulating: Habitat for species Cultural: Ecotourism
Quality of water bodies	No change*, Better, Optimum	Provisioning: Freshwater Regulating: Water quality control, water regulation, habitat for species Cultural: Ecotourism, aesthetic enjoyment
Native forest	17%*, 30%, 40% of the area	Provisioning: Food, freshwater, timber Regulating: Climate/air regulation, water regulation, and purification, erosion control, nutrient regulation, habitat for species Cultural: Ecotourism, aesthetic enjoyment, local identity
Recreation	No change*, Better, Optimum	Cultural: Ecotourism
Cost	0*, 5, 15, 30, 50, 100 EUR	–

* indicates the levels associated with the status quo alternative.

Each respondent was presented with six choice situations composed of three alternatives, one of which always referred to the no change (status quo) option and was associated with zero additional cost. The combinations of the attribute levels presented in each of the choice tasks (i.e., the experimental design) were selected in a Bayesian-efficient way (Ferrini and Scarpa, 2007; Scarpa and Rose, 2008), that is, to minimize the determinant of the expected AVC matrix of the estimates (D-error) given the priors on the parameters of a representative respondent's utility function derived from a pilot survey. An example of a choice card is presented in Figure 2.

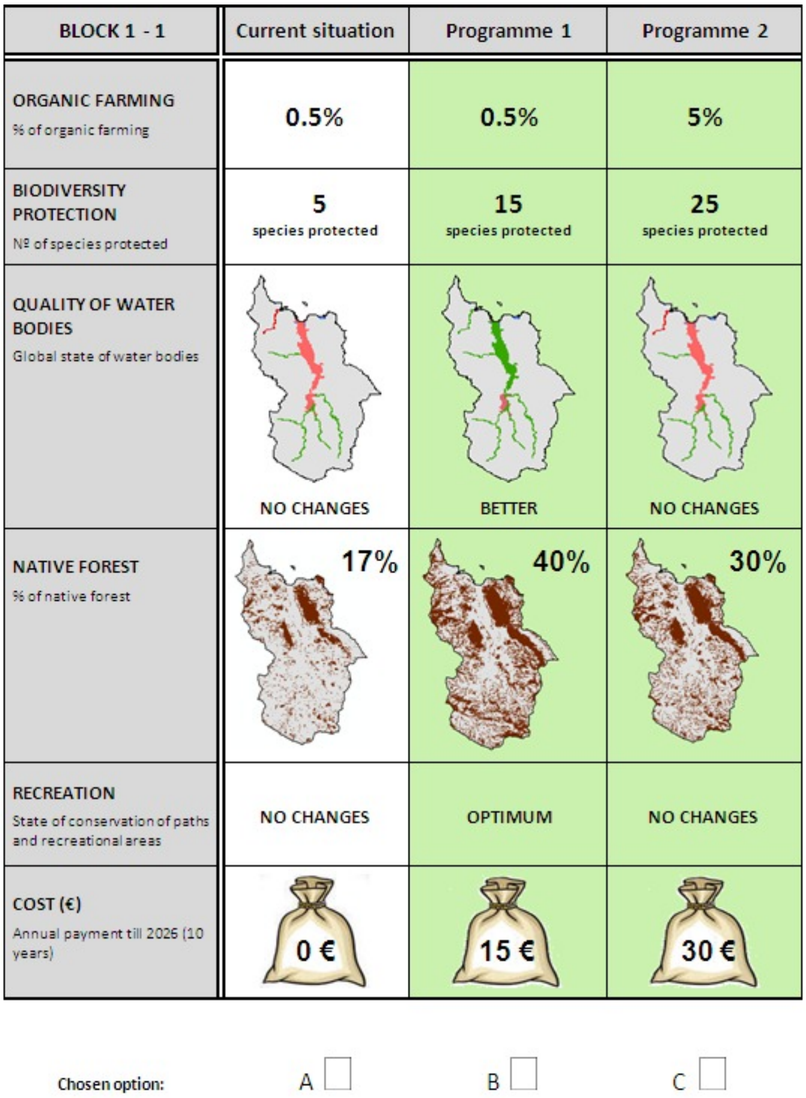

Fig. 2. Example of a choice card (English translation)

2.3. Sampling strategy and survey implementation

The survey collected data from the local population living in the UBR, accounting for approximately 30,000 people aged 18 and over. We interviewed a random sample of the population across the different municipalities. The sample was quota-controlled for age, gender, and town size (EUSTAT, 2017). Sample points were distributed in places with different land uses such as beaches, recreational areas, paths, croplands, or urban zones to account for different types of users. We restricted all questionnaires to citizens older than 18-years and included different stakeholders, i.e., potential users or beneficiaries, providers, and people affected by land use choices. We offered the option to answer the survey in Basque or Spanish, both official languages in the area.

In total, 266 successful face-to-face surveys were conducted from August to October 2016. The questionnaire was divided into four sections and included visual information (e.g., maps, pictures) to facilitate understanding and making the survey more pleasant to respondents.[1] The first section contained a brief explanation of the purpose of the study and a description of the UBR, including ES and land use attributes. The second section dealt with the different levels of ES and proposed land uses to be considered and explained the need to contribute economically. The DCE was presented in the third section. In case respondents chose no change (status quo) in the first choice, they were asked to provide their principal reason to identify protest responses. The final section collected socio-economic and other relevant information about respondents.

2.4. Econometric framework for data analysis

Choice preferences were based on the Random Utility Theory (McFadden, 1974), which assumes that individual n chooses the alternative j in choice situation t with regard to the highest utility:

$$U_{njt} = -\alpha_n c_{njt} + \beta'_n X_{njt} + e_{njt}, \tag{1}$$

where c_{njt} and X_{njt} are the cost and other non-monetary observable attributes, respectively; α and β are individual-specific coefficients associated with them (a negative sign indicates a decreasing utility in cost); and e_{njt} is a stochastic component identically and independently distributed with a constant variance $k_n^2(\pi^2/6)$, with k_n^2 being an individual-specific scale parameter.

The usual procedure is to estimate the distribution of the utility coefficients and then derive the distribution of the willingness-to-pay or WTP (preference space). Given that we are interested in marginal rates of substitution with respect to the monetary attribute c (WTP), it is convenient to introduce the following modification of Equation (1), which is equivalent to using a money-metric utility function (estimating the parameters in the WTP space; Train and Weeks, 2005). In this specification (rescaling of the utility function), the vector of parameters, $w = \beta/\alpha$, can be directly interpreted as a vector of implicit prices (marginal WTPs) for the non-monetary attributes, X, facilitating an interpretation of the results.

$$U_{njt} = -\alpha_n (c_{njt} + (\beta'_n/-\alpha_n) X_{njt}) + \varepsilon_{njt} = -\alpha_n c_{njt} + w'_n X_{njt} + \varepsilon_{njt} \tag{2}$$

[1] The survey instrument is available as a supplementary material to our study.

Although behaviourally equivalent to the model in a preference space, the advantage of the WTP-space model specification is twofold: first, it allows a money-metric utility function so that the vector of parameters associated with non-price attributes, w_n, can be directly interpreted as expressions of marginal WTP, rather than deriving welfare estimates indirectly, as in the traditional preference space. Second, it allows for a direct, and hence, more convenient specification of parametric distributions of WTP to be estimated.

We used multinomial logit (MNL) and multinomial mixed logit (MXL) models with uncorrelated and correlated random parameters to estimate the WTP for the different management alternatives. We applied the MNL model first, in which all respondents are assumed to have the same preference parameters, to understand the main factors affecting respondents' choices. After making sure that the MNL model works well and there are no problems with the data, we relaxed the implausible assumptions of the MNL by moving to the MXL model. The MXL model generalizes the MNL model by allowing for preference heterogeneity via the use of random parameters and correlation among choices (Banzhaf et al., 2001; Greene, 2017, Mariel and Meyerhoff, 2018).

According to the common practice cited in the literature, environmental attributes with an unclear direction of preferences were normally distributed, whereas the cost coefficient, for which we expect every respondent to prefer a lower level, was given a lognormal distribution. As lognormal distribution implies positive coefficients, we reversed the sign of the cost attribute levels. As a result, the probability that an individual n chooses alternative j in a set of C alternatives was represented by:

$$P(j|C)=\frac{\exp\left(-\alpha_n c_{njt}+w'_n X_{njt}\right)}{\sum_{k=1}^{C}\exp\left(-\alpha_n c_{nkt}+w'_n X_{nkt}\right)} \quad (3)$$

Because equation (3) has no closed form solution when applying a random parameter specification, we estimated the model using the maximum simulated likelihood method by averaging over 10,000 scrambled Sobol draws (Czajkowski and Budziński, 2017) from the distributions assumed for the random parameters (Revelt and Train, 1998).[2] As a result, the simulated log-likelihood function becomes:

$$\log L=\sum_{n=1}^{N}\log\frac{1}{D}\sum_{d=1}^{D}\prod_{t=1}^{T}\sum_{j=1}^{C}y_{njt}\frac{\exp\left(-\lambda_n c_{njt}+(\lambda_n w_n)'X_{njt}\right)}{\sum_{j=1}^{C}\exp\left(-\lambda_n c_{njt}+(\lambda_n w_n)'X_{njt}\right)} \quad (4)$$

[2] We estimated the models presented here using a DCE package developed in MATLAB and available at https://github.com/czaj/DCE. The code and data for estimating the specific models presented in this study, as well as supplementary results, are available from http://czaj.org/research/supplementary-materials.

where y_{nkt} is a dummy value, assuming the value of 1 if the alternative j is chosen in a choice situation t, and is zero otherwise. Maximizing the log-likelihood function in (4) provides efficient estimates for the parameters.

3. Results

3.1. Descriptive statistics of the sample

Table 2 presents the socio-demographic characteristics of respondents, along with some information about their environmental attitudes. The sample is divided into protest and non-protest respondents to illustrate the differences between respondents whose responses were used in the final analysis, and those whose responses were considered not to represent their preferences for the considered program. The latter may choose to declare zero WTP because, for example, they are generally against taxes, they do not find the scientific information and the program credible or declare zero WTP to manifest their attitude towards the payment vehicle (Jorgensen et al., 1999; Meyerhoff & Liebe, 2010). The proportion of protest responses in the sample was approximately 30%, which is considered high, although not unusual (Johnston et al., 2017). In accordance with the common procedure for treating protest responses (e.g. de Ayala et al., 2015; Torres et al., 2017), and to obtain reliable and unbiased welfare estimates that represent public preferences for the described changes of the studied ES, we excluded protest responses from the sample, reducing the dataset to 189 respondents (1,134 choice observations).

We found that respondents who identified as protesters are generally older, less educated, less likely to live with their children, and less likely to be employed. In addition, protesters are more likely to display above average Basque cultural identity levels (c.f., Faccioli, et al., 2018).[3]

Overall, after removing protesters, the sample gender differentiation (53% female), mean age (≈43 years), number of families with dependent children (45%), employment situation, and personal income (≈1,250 € per month) were in line with those of the overall population of the UBR region in 2016 (EUSTAT, 2017). Besides, 56% of the respondents had high education levels, and almost half of the respondents considered themselves above the average level of the Basque cultural identity. A total of 31% of the respondents lived in

[3] Statistical significance of the differences is confirmed using the chi-square test (Table 2).

a rural area, and 23% and 13% of those who lived in detached houses maintained vegetable gardens and forest lands, respectively. Nearly all respondents had some knowledge of the UBR. The percentage of respondents reporting the consumption of agricultural products with a quality label was relatively high in the sample (37%), while collaboration with environmental non-governmental organizations (NGO) was quite low (6%). Other variables of interest include a high frequency of the use of paths and recreational areas in the UBR (64%) and the appreciation of good quality bathing areas (only 58% agreed).

Table 2. Socio-demographic characteristics of non-protest (n=189) and protest (n=77) respondents in comparison with the general population

Variables	Description	Non-protest	Protest	χ^2	General population
Socio-demographic information					
FEMALE	Female	0.53	0.65		0.51
AGE	Age range (midpoint is used):	42.97	59.64	***	45.83
	18-30 yr	0.21	0.01		0.13
	31-45 yr	0.46	0.19		0.26
	46-60 yr	0.18	0.26		0.27
	61-75 yr	0.11	0.40		0.20
	>75 yr	0.04	0.14		0.14
CHILD	≥1 child at home	0.45	0.18	***	0.42
HSTUD	High education level	0.56	0.21	***	0.27
EMP	Employed	0.67	0.39	***	0.47
UNEMP	Unemployed	0.11	0.06		0.09
PINCOME	Monthly income range (midpoint):	1,248.92	1,169.16		1,543.02
	0 €	0.13	0.04		
	<450 €	0.05	0.06		
	451-900 €	0.18	0.25		
	901-1.500 €	0.26	0.38		
	1.501-2,000 €	0.21	0.18		
	2,000-2,500 €	0.09	0.06		
	>2,500 €	0.08	0.03		
Environmental issues					
BIOSPH	Knowledge of the UBR	0.91	0.93		
HLABEL	High consumption of agricultural products with quality labels	0.37	0.30		
NGO	Economic collaboration with an environmental NGO	0.06	0.04		
Other variables of interest					
RURAL	Living in a rural area	0.31	0.39		
FARM	Vegetable garden owner (only emancipated, n=151 and 73)	0.23	0.29		
FOREST	Forest landowner (only emancipated, n=151 and 73)	0.13	0.22		
HREC	Frequent use of paths and recreational areas in the UBR	0.63	0.53		
BATH	Good quality of bathing areas	0.58	0.67		
IDENTB	Basque cultural identity above the average level	0.44	0.60	**	

UBR–Urdaibai Biosphere Reserve, NGO–Non-governmental organization, χ^2–Chi-square test. Significance at the * = 10%, ** = 5% and *** = 1% levels.

3.2. Respondents' preferences and willingness-to-pay

Respondents' choices in the DCE allow for an estimation of the utility function parameters, which represent respondent preferences for the new land use management options and the associated ecosystem services changes. The results are presented in Table 3. As our model is estimated in WTP-space, the coefficients can be readily interpreted as respondents' WTP for changes in dummy-coded attribute levels with respect to the baseline (reference) level.

Table 3. The results of the multinomial logit (MNL) model and the multinomial mixed logit (MXL) models with uncorrelated and correlated random parameters, illustrating respondents' preferences (willingness-to-pay in EUR) for selected land use management options and the associated ecosystem services changes

	MNL	MXL (no correlations)		MXL (correlated parameters)	
	Coef. (st.err.)	Mean (st.err.)	St. dev. (st.err.)	Mean (st.err.)	St. dev. (st.err.)
Status quo (ASC)	2.69	-86.31***	187.18***	-72.77***	174.15***
	(6.98)	(10.51)	(17.83)	(0.37)	(0.84)
Organic farming 2%	11.84**	14.28***	4.51	8.72***	29.47***
	(4.80)	(2.77)	(3.53)	(0.23)	(0.43)
Organic farming 5%	15.37***	15.38***	11.25***	10.61***	9.25***
	(4.65)	(2.81)	(4.10)	(0.26)	(0.22)
Biodiversity protection 15	14.63***	10.43***	2.70	7.24***	23.31***
	(4.71)	(2.47)	(2.63)	(0.29)	(0.35)
Biodiversity protection 25	15.39***	17.24***	26.61***	19.10***	35.45***
	(4.72)	(3.16)	(3.31)	(0.23)	(0.40)
Quality of water bodies better	41.06***	39.58***	16.55***	33.46***	35.44***
	(5.04)	(2.95)	(3.27)	(0.39)	(0.45)
Quality of water bodies optimum	49.74***	50.80***	42.59***	40.26***	61.79***
	(5.10)	(3.12)	(4.22)	(0.38)	(0.47)
Native forest 30%	18.78***	11.62***	3.00	12.40***	27.60***
	(4.89)	(2.97)	(2.80)	(0.35)	(0.27)
Native forest 40%	19.49***	16.60***	3.80	21.10***	22.03***
	(4.73)	(2.55)	(3.66)	(0.40)	(0.23)
Recreation better	8.49*	0.39	4.78**	3.08***	20.00***
	(4.74)	(2.50)	(2.33)	(0.44)	(0.27)
Recreation optimum	3.97	0.60	0.67	5.37***	17.43***
	(4.83)	(2.75)	(3.21)	(0.54)	(0.38)
Cost	2.19***	2.28***	1.27***	6.32***	3.93**
	(0.16)	(0.34)	(0.33)	(1.47)	(0.80)
Model diagnostics					
Log likelihood at convergence	-1064.46	-706.61		-639.53	
Log likelihood at constants only	-1205.66	-1205.66		-1205.66	
McFadden's pseudo-R^2	0.1171	0.4139		0.4696	
Ben-Akiva-Lerman's pseudo-R^2	0.4167	0.5645		0.5950	
AIC/n	1.8985	1.2886		1.2866	
BIC/n	1.9518	1.3951		1.6861	
Observations (n)	1134	1134		1134	
Respondents	189	189		189	
Parameters	12	24		90	

St.dev.–Standard deviation, st.err.–Standard error, AIC–Akaike Information Criterion, BIC–Bayesian Information Criterion. All random parameters of the utility function are modelled as normally distributed (except for the cost parameter, which is assumed to follow a log-normal distribution; the estimates of the underlying normal distribution are provided; we use a negative cost attribute expressed in 100 EUR). The estimated correlation coefficients are reported in the supplementary materials available online. Significance at the * = 10%, ** = 5% and *** = 1% levels.

The means of the coefficients are of the expected signs, and the estimates are consistent across models in terms of significance. Comparing the three specifications, we find that while the

MXL model with uncorrelated parameters outperforms the MNL model[4], the MXL with correlated parameters fits our data best.[5] This indicates that accounting for preference heterogeneity and the correlation of the parameters of dummy-coded attribute levels provides significant insights into the data generating process, despite requiring additional parameters.

Based on the results of the best-fitting model (MXL with correlations) we find that respondents prefer moving away from the status quo and implementing protection actions in the UBR. The program is considered more valuable (respondents are more likely to choose an alternative) if it offers the highest improvements for the quality of water bodies, followed by native forest, organic farming, and biodiversity protection. Consistent with the economic theory, the higher the cost, the lower the support for the program (the lower the probability of choosing an improvement alternative). Finally, we note that there is substantial unobserved heterogeneity of respondents' preferences, as evidenced by relatively large and significant estimates of standard deviations of the WTP distributions in comparison to their means. Focusing on the WTP estimates, Table 4 presents mean marginal WTP for each attribute level, along with the corresponding 95% confidence intervals.[6] Mean marginal annual WTP for increasing the quality of water bodies to "better" or "optimum" levels was estimated at 33.46 EUR and 40.26 EUR per person, respectively.

Similarly, the WTP for increasing the native forest surface from the current 17% to 30% or 40% was 12.40 EUR and 21.10 EUR, respectively. Increasing the area where organic farming practices occur from the current 0.5% to 2% or 5%, was valued at 8.72 EUR and 10.61 EUR, respectively, and increasing the number of protected species from the current 5 to 15 or 25 species was worth 7.24 EUR and 19.10 EUR, on average. Finally, our study indicates that WTP for improving the quality of paths and recreational areas to the "better" and "optimal" state, as defined in the survey, was equal to 3.08 EUR and 5.37 EUR, respectively.

[4] LR-test statistic = 715.70, degrees of freedom = 12, p-value < 0.0001.
[5] LR-test statistic = 134.16, degrees of freedom = 66, p-value < 0.0001.
[6] Following Czajkowski et al. (2014), the confidence intervals were simulated following a two-step Krinsky and Robb (1986) procedure, drawing coefficients from the vector of parameter estimates and their asymptotic variance-covariance matrix and next drawing correlated random parameters from their multivariate distribution, described by the coefficients drawn in step 1. Each step used 10,000 iterations.

Table 4. Mean marginal willingness to pay (WTP in EUR per person and year) along with the simulated 95% confidence intervals (c.i.)

	WTP	
Attributes	Mean	95% c.i.
Organic farming 2%	8.72	(7.99-9.47)
Organic farming 5%	10.61	(10.06-11.16)
Biodiversity protection 15	7.24	(6.49-7.96)
Biodiversity protection 25	19.10	(18.27-19.91)
Quality of water bodies better	33.46	(32.42-34.49)
Quality of water bodies optimum	40.26	(38.84-41.69)
Native forest 30%	12.40	(11.54-13.28)
Native forest 40%	21.10	(20.20-21.99)
Recreation better	3.08	(2.12-4.02)
Recreation optimum	5.37	(4.27-6.46)

4. Discussion and conclusions

Overall, our findings suggest that the local population supports the new landscape management program in the UBR which focuses on the improvement of ecosystem health, landscape multifunctionality, and sustainability. The results show consistent preferences for certain management practices that are directly linked to multiple ES while providing WTP measurements for each of the categories, thereby offering policy-relevant insights to the complex trade-offs associated with selected land uses (Foley et al., 2005; Berry et al., 2016).

The most valued attribute by residents of UBR was the quality of water bodies. Numerous studies have evaluated the WTP for improving the quality of water bodies (e.g., García-Llorente et al., 2012; Doherty et al., 2014; Ahtiainen et al., 2013, Hanley at al., 2015, Tuhkanen et al., 2016, Pakalniete et al., 2017). Considering the poor chemical and ecological state of the Oka river estuary and the Gernika aquifer (Gobierno Vasco, 2004), which also affect bathing waters, high WTP for improving water quality comes as no surprise. The quality of water bodies is a clear indicator of ecosystem health, and it is directly related to other ES such as habitat for species, ecotourism, and aesthetic values, principal attractions, and objectives of the UBR. In addition, the deficient chemical quality of water bodies directly affects drinking water, which together with the poor quality of the aquifer, worsens the difficulties in guaranteeing the water supplies in the summer, when rainfall declines and the population in the area almost triples.

In contrast, and in accordance with an earlier study in the UBR (Castillo-Eguskitza et al., 2018), the improvement of the recreation-related attributes was the least valued by the respondents. The reasons for lower interest in recreation could be related to respondents being relatively satisfied with the current state of the conservation of paths and recreational areas, or to the relatively lower importance of recreation to respondents. Likewise, the local population may link the improvement of the state of paths and recreational areas to a large influx of tourists, rejecting actions that might lead to increased crowding. Related to this last consideration, to give an example, Bakhtiari et al. (2014) found that forest visitors in Denmark are willing to travel further to avoid crowded forests, whereas López-del-Pino and Grisolía (2017) show that visitors are willing to pay an entrance fee to reduce the congestion on the Canary island of Lobos. Sustainable or responsible tourism, i.e., a small-scale, decentralized, environmentally and culturally friendly and locally-based approach where all stakeholders are involved, is widely demanded (e.g. Brandful Cobbinah, 2015; Dangi & Jamal, 2016); a possible interpretation of our approach is that the local population of the UBR could empathize with this type of tourism.

A variety of land uses and high levels of biodiversity, which are commonly associated with multifunctional landscapes (Pasari et al., 2013), were found to be demanded by the inhabitants of UBR. Multifunctionality involves meeting multiple ecological, economic, and socio-cultural services for multiple social actors within a territory. Nonetheless, land use changes that occurred in the UBR over the last decades that led to the predominance of pine and eucalyptus plantations and landscape homogenization have limited multifunctionality and result in reductions in the flow of ES (Stürck & Verburg, 2017). Modifying land uses may facilitate multifunctional landscapes and enhance sustainability in human-dominated areas (Waldhardt et al., 2010).

In this context, we found that the local population demonstrated a significant desire to increase the amount of native forest by the substitution of exotic pine and eucalyptus plantations. Correspondingly, Hoyos et al. (2012) concluded that people's WTP for increasing native forest in the Basque Country was positive, but negative for non-native tree plantations. In fact, woodlands management is recognized as one of the most important direct drivers of ES for successful intervention in Biscay, and it has a significant influence on the landscape and the flow of services (Palacios-Agundez et al., 2013). According to Onaindia et al. (2013a), native forests in the UBR contribute the most to biodiversity and are very important for carbon storage and water regulation. On top of that, broadleaf forests are considered to be linked with the Basque cultural identity (Hoyos et al., 2009; Wing, 2015), and are particularly relevant for the UBR, where holm oak (*Gernikako Arbola*), a symbol of the Basque identity and traditional liberties, can be found.

Similarly, but to a lesser extent, the local population also supported an increase in agricultural areas where sustainable agricultural practices are implemented.[7] This land use change involves reducing or eliminating ploughing to prevent soil loss, minimizing the use of chemical pesticides, mixing trees or shrubs, creating habitat for pollinators and other native species, as well as promoting urban gardens. These results are in line with other studies in Biscay and Araba (provinces of the Basque Country), which show that users demand the local production of food (Casado-Arzuaga et al., 2013) and organic farming (de Ayala et al., 2015). Likewise, they support the argument that element-richness, i.e., green elements like trees and hedges, may increase landscape attractiveness (van Zanten et al., 2016; Häfner et al., 2018). Taken together, environmentally friendly agriculture could be an appropriate response to enhancing landscape multifunctionality and ES provision while increasing sustainability and decreasing the energy demand or water consumption associated with imported foods (Palacios-Agundez et al., 2015). In addition, organic farming is associated with regulating services such as erosion control, nutrient regulation, pollination, biological control, and habitat for species (FAO/WHO, 1999; Lori et al., 2017) as well as cultural services such as traditional knowledge, ecotourism, and aesthetic enjoyment (Choo & Jamal, 2009; Agnoletti, 2014).

As far as biodiversity protection is concerned, similar studies in other contexts found that people generally support higher levels of species protection (e.g., Czajkowski et al., 2009; Hanley et al., 2010; Hoyos et al., 2009; Shoyama et al., 2013; Wallmo & Lew, 2016), and consistent with native forest attribute, native animal species are more appreciated than exotic ones (Yao et al., 2014). In line with these findings, the local population was in favour of protecting a higher number of endangered species, even if the protection of these species would imply the conservation and protection of their habitats or the associated restrictions of some activities in specified periods (e.g., the breeding season).

The new landscape management program in UBR faces some important challenges. As in the case of many other European countries, a large percentage of the UBR area (nearly 92%) is privately owned. Consequently, conflicts between public and private interests have made its management difficult (Onaindia et al., 2013b), and although we conclude that, in general, the local population may prefer multifunctional landscapes, alternative management scenarios will always lead to potential conflicts between stakeholders. In the case of increasing native forests

[7] Admittedly, the design of our study does not allow concluding if respondents prefer to increase the overall area of agricultural land or wish to keep the area of agricultural land constant while substituting current practices with sustainable practices.

by replacing pine and eucalyptus plantations, it is likely that forest owners would be economically harmed. Similarly, conflicts may arise in the case of animal and plant species protection (Chapron et al., 2014; Martínez-Jauregui et al., 2017).

In this sense, economic valuation may arise as a complementary tool to traditional conservation strategies to promote sustainable land management. Traditional conservation strategies are usually based on biophysical valuation and rarely consider public preferences, social systems, or trade-offs generated by decision making (Giergiczny et al., 2015). However, sustainability involves the understanding of environmental, economic, and social interactions. Thus, biophysical and socioeconomic assessment of ES needs to be considered jointly, and management measures should be both ecologically effective and socially desirable (Varela et al., 2018) so that the degree of coexistence between groups of people can be improved. Compensatory measures are likely to reduce disagreements between dwellers and result in a type of win-win solution and maximize social welfare. As a result, monetary incentives, such as payments for ES, agro-environmental schemes or land stewardship are becoming increasingly popular as a way of managing ecosystems and safeguarding or enhancing ES (van Noordwijk et al., 2012; Pascual et al., 2014; Ferguson et al., 2016; Czajkowski et al., forthcoming).

In summary, this study demonstrates how stated preference methods (and DCE in particular) can provide valuable and policy-relevant inputs that support landscape management for sustainability. These inputs include not only a deeper understanding of public preferences for the considered management options, but also quantitative WTP measures for the changes in the provision of ES in the UBR. We find increasing social welfare associated with improvements in the quality of transitional waters and the Gernika aquifer, the restoration of native broadleaf forests in place of pine and eucalyptus plantations, changes in rural activity aimed at sustainability and organic farming, and measures taken to support biodiversity increases and the protection of threatened species. In addition, these results can be used readily in a cost-benefit analysis for implementing such practices and offer support in prioritizing investments and allocation of funding, according to the actions that generate the highest social benefits. Overall, our study demonstrates the extent of benefits associated with ES-oriented land use management, which we believe is fundamental for ensuring sustainable policies and maximizing social well-being.

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University of Warsaw
Faculty of Economic Sciences
44/50 Długa St.
00-241 Warsaw
www.wne.uw.edu.pl