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Evaluation of environmental actions by local citizens – a choice modeling application

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Little is known about citizens' judgment of nature conservation actions financed by public funds. The present work contributes to this topic with empirical evidence coming from a Choice Modeling (CM) study designed in an innovative mode. Using the participatory budget format, a CM exercise elicited respondents' choice between the allocation of public funds for nature conservation actions versus other actions (e.g. social or economic interventions). The case study comprises an EU-LIFE project managed by a Portuguese municipality. Results highlight the importance of awareness of and accessibility to environmental goods, as those that are more willing to pay use the area for leisure activities and have a greater knowledge about it. In addition, we suggest that CM can be used as a tool to uncover citizens' preferences regarding public budget allocation which can contribute to a democratization of decision making at this level.

Keywords: choice modeling; public budget allocation; nature conservation; EU-LIFE program; public policy

1. Introduction

Citizens' direct guidance to allocate public budgets is becoming an important topic of discussion and has seen significant developments in several countries (Franco and Assis 2019; Saguin 2018). One of the most well-known activities to bring citizens into the decision-making process of budget allocation is participatory budgeting. It is a different way to manage public money and to engage citizens in decision-making. It enables taxpayers to work together with the government to make budget allocation decisions that affect their lives. It is a management accounting activity first developed within the private sector where managers' are involved in, and influence the setting of their units' budgets (Argyris 1952). More recently, this idea was adopted in the public sector (e.g. Participatory Budgeting Project) with the goal of allowing citizens the opportunity to have a direct influence on the definition of the priorities and allocation of public funds (Bodart 2014). Although we do not intend to contribute to the body of knowledge regarding participatory budgeting we have been inspired by its principle to

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design a Choice Modeling (CM) exercise aimed at evaluating actions funded by a specific environmental conservation project. In particular, we develop a modified version of the CM approach to unravel citizens' preferences for it's budget allocation.

CM is one of the approaches included in a larger group designated as Stated Preference (SP) methods (Bateman *et al*. 2002). This group includes several techniques which assess the preferences of individuals to estimate change in utility related to an increase in the quality or quantity of an ecosystem service or bundle of services. Depending on the technique used, one or more hypothetical policy or project scenarios are presented to respondents. The project or policy will lead to a specified environmental change compared to a baseline situation. The answers attained, in the form of monetary amounts, ratings, or other indications of preference, are scaled following an appropriate model of preferences to yield a measure of value of the proposed ecosystem service change. The value is often monetary in the form of people's willingness to pay (WTP).

The two most prominent SP methods are the contingent valuation method (CVM) (Mitchell and Carson 1989) and discrete choice experiments (DCE) (Louvieres, Hensher, and Swait 2000). The application of SP methods is wide, mainly as a decision-making support tool (Börger *et al*. 2014; Laurans and Mermet 2014). Due to the frequent use of SP results in decision-making, great attention is often given to the quality of the estimations attained (Kanya *et al*. 2019). Therefore, several manuals have been developed to assure that the design of each application allows the estimation of values that are consistent and can be used in several forms of decision-making (e.g. Johnston *et al*. 2017; Kanninen 2006; Champ, Boyle, and Brown 2003; Bateman *et al*. 2002; Haab and McConnell 2002). Most SP studies focus on the estimation of value, yet our goal was distinct; our aim was to assess citizens' preferences about public budget allocation, specifically about nature conservation expenditure. Within this topic we found few studies that discuss budget reallocation and CM (Morrison and MacDonald 2011; Remoundou *et al*. 2014; Ozdemir, Johnson, and Whittington 2016). Despite the lack of dedicated literature, we agree with Morrison and MacDonald 2011 that although non-market valuation techniques focus on respondents paying additional amounts of money for increased provision of a public good, in many circumstances this may not be appropriate. In circumstances such as the one in our case study, the public budget is defined and the question is not on how to increase it but the amount of expenditure on other public goods that citizens are willing to forego for local government to provide more of another public good.

The case study consists of one project funded by the EU-LIFE program developed and managed by a Portuguese municipality. To the best of our knowledge, no previous study has attempted to assess citizens' evaluation of the actions planned within a project funded by this program. Although the EU-LIFE program contemplates a strong interaction with citizens through dissemination activities, the actions to be funded are part of a project proposal submitted for approval by the coordinating beneficiary (Lehmann *et al*. 2005). There is no direct influence of citizens on the design and prioritization of the actions included in each project. Therefore, one could ask whether citizens' preferences are in accordance with such allocations of public funds.

The primary goal of the present study was to understand citizens' level of agreement regarding public budget allocation. To arrive at this objective we use a modified version of the CM which in turn allowed us to defined two secondary objectives: a) understand what influences citizens' WTP; and b) test the capacity of CM to use a public and collective monetary attribute.

Therefore our study relevance comprises three main results. First, we assess citizens' support for the EU-LIFE project at the level of the actions planned by the project leaders. Secondly, our results highlight factors that can influence the recognition of conservation efforts such as the ones put in place by the EU-LIFE program. Finally, we suggest a modified CM design that, to the best of our knowledge, has not yet been reported. In particular, we use a monetary attribute that, instead of focusing on individuals' WTP, is specifically targeted at eliciting their willingness to allocate the available public funds to different nature conservation actions. It follows the same reasoning of participatory budgeting where citizens can directly decide where to spend part of the public budget managed by their local government. In addition, it resembles studies on budget reallocation (Morrison and MacDonald 2011; Remoundou *et al*. 2014; Ozdemir, Johnson, and Whittington 2016) although these studies focus on different contexts and CM designs.

The article progresses with the introduction of the case study, followed by a description of the methodological approach. Afterwards, we present and discuss the results obtained. Finally, we provide some concluding remarks.

2. Case study: EU-LIFE project – ecological restoration and conservation of Praia da vitória coastal wet green infrastructure

The EU-LIFE program is the EU's funding instrument for the environment and climate action (Lehmann *et al*. 2005; Marino *et al*. 2014; European Union 2016). The general goal is the implementation, updating, and development of EU environmental and climate policy. It is an important funding scheme for nature conservation in many European countries and an adequate case for the present study since it funds concrete actions toward nature improvement. Private individuals and other legal entities may lead projects. Depending on the character of the project, EU co-financing may account for 30–100% of the total costs (Lehmann *et al*. 2005).

The case study is an EU-LIFE project devoted to wetlands conservation in Terceira Island, Azores, in the North Atlantic Ocean about 1,400 km west of mainland Portugal (Figure 1).

The island includes a peculiar bay named Praia da Vitoria. The peculiar feature of this bay is a fragmented wetland previously integrated in a 3 km long dune system with a sandy beach and salt marshes (Bannerman and Bannerman 1966). Such a habitat type is rare in volcanic islands, which mostly entail rocky shorelines. Human

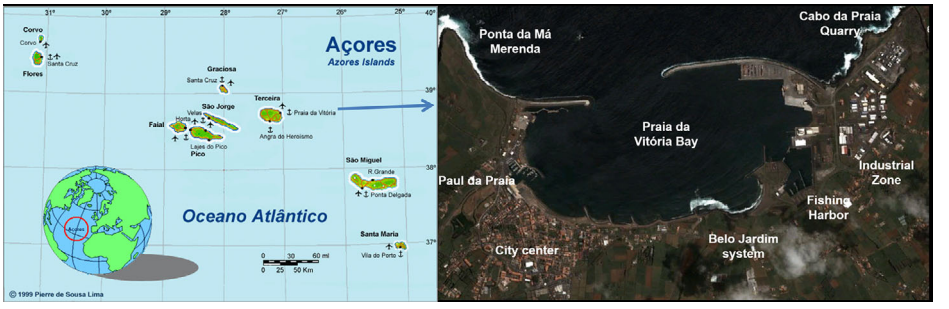

Figure 1. Azores and Terceira island location, followed by a satellite image of Praia da Vitória Bay with an indication of the main elements. (Source: Google Earth).

activities explain the drastic change in the old system, now reduced to two small areas: Paul da Praia da Vitória (PPV) with an area of 40,000 m2) and Belo Jardim (BJ) with an area ca. 3,000 m2. While urban expansion reduced the old dune system it also promoted the appearance of an artificial wetland called Paul da Pedreira (PP). PP is a former quarry explored until the coastal water table was reached. With this, during high tide, the groundwater fills part of the depression within the quarry (Morton, Britton, and de Frias Martins 1997). Over time, the water percolation resulted in the existence of fine sediments, vegetation, and several other organisms. Today, this artificial formation of 150,000 m^2 is one of the most famous bird watching sites in the Azores (Guimarães *et al*. 2014).

In 2013, Praia da Vitória municipality submitted to the EU-LIFE program the project CWR - Ecological Restoration and Conservation of Praia da Vitória Coastal Wet Green Infrastructure. The project leaders tried to develop a set of actions that simultaneously increased the ecological relevance of the wetlands, their attractiveness for bird watchers, and citizens' awareness of their existence and importance. Part of the project included actions of ecological restoration and redevelopment of the three key wetlands: PPV, BJ, and PP, making them an integrated network of wetlands with different characteristics associated with different types of birds.

3. Material and methods

Stated preference methods are often used to elicit individuals' preferences and economic valuation of environmental amenities. These are typically implemented through questionnaires where respondents are presented with hypothetical scenarios and asked to express their preferences (Adamowicz *et al*. 1998; Bateman *et al*. 2002). In CM, different sets of alternatives (choice sets) defined by attributes with different levels (varying across the sample) are presented to individuals, who express their preferences for the alternatives. By defining one of the attributes as a price or cost term, marginal utility estimates can be converted into WTP estimates for changes in attribute levels, and welfare estimates obtained for combinations of attribute changes.

Within CM, the Choice Experiment (CE) – the technique used in this study – is the most popular. The CE is based on random utility theory and provides information on tradeoffs between the attributes in question (Adamowicz *et al*. 1998). Individuals are assumed to choose the alternative that maximizes their utility. It has become a typical technique used to study how people make choices (Grilli, Notaro, and Campbell 2018). Its application usually implies the comparison between the Business-as-Usual (BAU) situation, at zero price, and two other alternatives, each including a positive payment for the corresponding package of attributes. Individuals are asked to pick their preferred alternative out of this set of alternatives.

The CM has been widely used in valuing biodiversity with most studies focusing on a single species (Pearce 2001; Hanley *et al*. 2003; Grilli, Notaro, and Campbell 2018). These studies use the CM to assess individuals' WTP for nature conservation and fewer studies have focused on public budget reallocation (e.g. Remoundou *et al*. 2014). Frequently, studies focus on the characteristics of the environmental goods themselves, but within the context of agri-environment policies and other nature conservation policies we found some studies that, like ours, define attributes in terms of the different aspects of (environmental) policy design (Ruto and Garrod 2009; Cerda,

Ponce, and Zappi 2013; Cleland, Rogers, and Burton 2015; Perni and Martínez-Paz 2017; Tarfasa *et al*. 2018).

3.1. Choice experiment design

The first step of the CE design was the selection of the attributes and their respective levels (see Table 1). This was done by clustering the actions defined in the LIFE CRW project into four groups corresponding to four CE attributes. The last attribute, the monetary attribute, corresponds to the overall project budget regarding the amount of money used to implement the proposed conservation attributes (i.e. the clustering of the actions defined in the LIFE CRW project). The choice of levels for the BUDGET attribute was assisted by the pilot survey. The BUDGET attribute included 5 levels, the first level represents the total real budget for the LIFE project. Therefore, in the first level 1,400,000€ is made available for other projects in the municipaly. The intermediate levels implied that these values are spent on other projects in the municipality while the remaining is used for the LIFE project. The final level of 0 € implies that all the budget is spent on the LIFE project actions and no money is allocated to other projects in the municipality.

In addition to the BAU scenario, each choice set included two other scenarios. The BAU scenario corresponds to the reference situation (i.e. before the project implementation). Given the number of attributes and their respective levels, a total of 64 different choice alternatives were possible ($2 \times 2 \times 2 \times 2 \times 4$). Since the choice set was too large, efficient design techniques (constructed using the Ngene version 1.1. software) were used, leading to the selection of a factorial design with 20 alternatives, gathered into four groups of five choice sets each. Given the existence of four groups of alternatives we developed four versions of the questionnaire, each one including five choice situations. The five-choice situations were randomly allocated to the four questionnaire versions. Respondents were asked to choose their preferred alternative out of a set of three choices, one of them always being the BAU scenario, and then to repeat the choice exercise four more times for different choice sets. Summing up, the respondents made five choices.

All attributes were explained before the CM exercise with the use of pictures to portray the changes. Figure 2 depicts an example of a choice situation as presented to the respondents. Visual representations were used to help participants understand the difference between the three alternative options. Symbols representing the attributes were chosen and maintained along with the different choice sets. Before the CE exercise, in the explanation of the project the same symbols were used to maintain consistency and facilitate the CE exercise.

The questionnaires included five sections (Table 2). All questions were closed-ended, although interviewees were invited to leave comments at the end. The number of questionnaires was calculated using a random stratified sampling method based on the 2011 population figures (data from the 2011 National Census). The sample size was sufficient to ensure a maximum margin of error of 7.45% for a 95% confidence interval on the population proportion. Its application was done face-to-face by one trained and fully dedicated interviewer in a door-to-door survey. To test the design of the questionnaire, 32 pilot questionnaires were completed in April 2017. From the pilot survey, some wordiness was improved and the CE design validated. Each questionnaire took between 30 to 40 minutes to complete and the interviewer assisted all. To

Table 1. Attributes and levels used in choice sets.

Attributes	Description	Levels
Ecological improvement of Paul da Praia da Vitória (PPV) actions	• Extension of the water surface • Increase of water circulation by creating a direct connection to the sea • Restoration of the typical vegetation of wetlands • Monitoring of water, fauna, and flora	Yes − 1, No − 0
Naturalization of Belo Jardim (BJ) wetland actions	• Excavation of the wet area • Improvement of vegetation typical of wetlands • Access to the area by walkways to protect the vegetation • Creation of a parking area and observation tower to welcome birdwatchers • Monitoring of water, fauna, and flora	Yes − 1, No − 0
Zonal planning intervention in Paul da Pedreira (PP) actions	• Improve access to the PP preventing anthropogenic disturbance • Construction of a parking area • Monitoring of water, fauna, and flora	Yes − 1, No − 0
Monitoring, dissemination and environmental education (EDU) actions	• Adding information panels close to each wetland • Organization of environmental awareness activities • Provide logistical support for birdwatchers • Development of an online birdwatching system and real-time images of the birds present • Creation of an environmental interpretation center	Yes − 1, No − 0
A budget allocation that would be made available to other projects in the municipality (BUDGET)	The amount of public money that would be made available to other projects within the municipality	1,400,000 € (the BAU scenario), 1,150,000 €, 750,000 €, 450,000 €, and 0 € (all budget is spent on the current project actions)

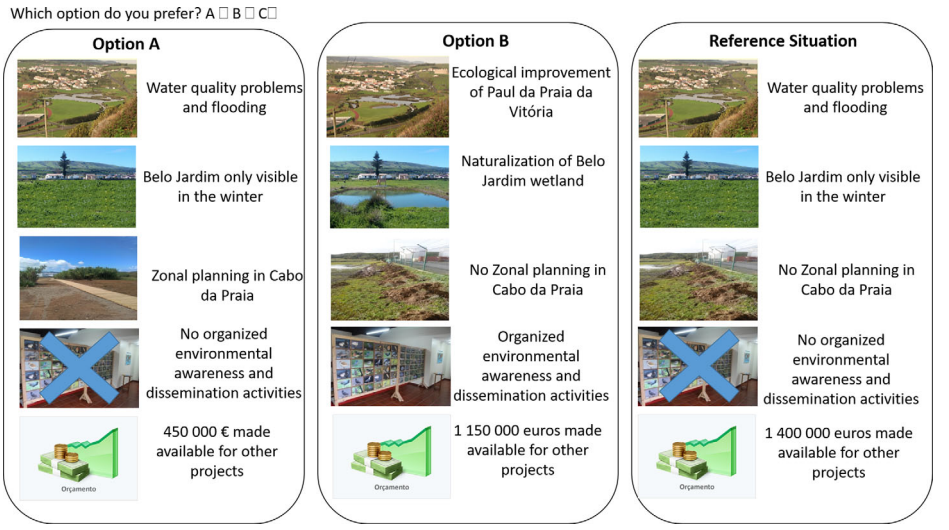

Figure 2. Attributes presented to the respondents and an example of the Choice Modeling exercise.

avoid the effects of respondent fatigue, the CE questions were placed at the beginning of the questionnaire. The response rate was 98% and a total of 300 completed and valid questionnaires were obtained and used in the statistical analysis. The survey campaign occurred between June and September of 2017 and an average of four questionnaires per day were completed.

3.2. *Statistical method*

To estimate respondents' preferences for the conservation attributes we used the multinomial logit (MNL) model in a similar manner to Guimarães *et al.* (2014). In the MNL model, the dependent variable is the alternative chosen by a respondent in each choice situation. The alternatives can take one of three possible values – option A, option B, or the BAU reference scenario option. In each choice situation the respondent opts for one of the alternatives that imply diferent attribute levels. These levels are used as explanatory variables.

In our case, each respondent faced five choice occasions ($T = 5$), each with three possible alternatives ($J = 3$): A, B, and the BAU scenario. Alternatives were characterized by the levels of the following five attributes ($K = 5$): PPV (ecological Improvement of PPV), BJ (naturalization of BJ), PP (zonal planning of PP), EDU (monitoring, dissemination, and education), and BUDGET. The BUDGET attribute is calculated as 1,400,000 Euros minus the BUDGET attribute described to respondents (see Table 1 and Figure 2), i.e. BUDGET is the amount of money used to implement the proposed conservation attributes. Therefore, for the BAU alternative, the level of the BUDGET attribute equals zero, so that the entire budget of 1,400,000 Euros is not spent on the implementation of any of the four conservation attributes and is consequently available to support other undefined actions.[1]

We followed the standard random utility model with a utility function modeled as a linear function of the attributes. Let N denote the number of respondents, T denotes the number of choice occasions faced by each respondent, and J denotes the number

Table 2. Questionnaire structure.

1st section: Relationship between the interviewee and the wetlands	
Code	Description
KNOWLEDGE	For each wetland, whether the respondent knows about it: 1 – yes; 0 – no.
FREQUENCY	For each wetland, if the respondent visually contacts it: 1 – at least 4 times per year; 0 – less than 4 times per year.
LEISURE	For each wetland, if the reason for passing by is related to a leisure activity: 1 – Leisure activities (e.g. walking, sports, or bird watching); 0 – other reasons.
SATISFACTION	For each wetland, the level of satisfaction of the visits done so far on a scale from 1 - very satisfied to 5 - very unsatisfied.
DISTANCE	The distance of each wetland to the respondent's home in km.
2nd section: Socio-demographic characteristics	
AGE	Age of the respondent in years.
GENDER	Respondent's gender: 1 – women, 0 – men.
EDUCATION	Respondent's education level: 1 – completed upper-secondary education level or higher, 0 – otherwise.
HOUSEHOLD	Number of elements in the household.
INCOME	Monthly income of the respondent as well as the income for the household.
OCCUPATION	Respondent's occupation: 1 – works in the public sector, 2 – private sector, 3 – student, 4 – unemployed, 5 – retired.
3rd section: Activities related to nature conservation	
NGO	Respondent belongs to a conservation NGO: 1 – yes, 0 – no.
CONTRIBUTION	Respondent contributes monetarily to nature conservation actions: 1 – yes, 0 – no
4th section: The hedonic evaluation exercise	
Several questions to characterize the house to be used in a hedonic valuation exercise.	
5th section The choice modeling exercise	
The choice modeling exercise was explained. Each respondent faced five different choice situations. In each choice situation, respondents had to choose one alternative out of the three that were presented.	

of alternatives within each choice set. The utility an individual $n = 1, \ldots, N$, gets from alternative $j = 1, \ldots, J$, in a choice occasion $t = 1, \ldots, T$, is represented as $U_{ntj} = ß'\chi_{ntj} + \varepsilon_{ntj}$, where χ_{ntj} is a vector of K attributes, $ß = (ß^1, \ldots, ß^K)$ is the corresponding vector of parameters, and ε_{ntj} is an i.i.d. error term with a Gumbel distribution. It follows that the conditional probability that an individual n chooses alternative j in choice occasion t is given by $p_{ntj} = \exp(\lambda ß'\chi_{ntj})/\sum_{m=1,\ldots,J} \exp(\lambda ß'\chi_{ntm})$, where λ is a positively valued scale parameter, inversely proportional to the variance of the error term. Since this scale parameter cannot be identified separately from ß, it is commonly normalized to $\lambda = 1$. The vector of parameters ß in this model is estimated by standard maximum likelihood procedures.

As usual, it is possible to calculate WTP values for each of the conservation attributes as the ratio between the estimated coefficient of the conservation attribute and of

the monetary attribute $WTP_j = -ß^i/ß^5$, where $ß^i$, $i = 1, \ldots, 4$, correspond to the coefficients of the four conservation attributes considered, and $ß^5$ is the coefficient of the BUDGET attribute.

The interpretation of this WTP is different from the usual one since in our case the monetary attribute is the amount of money that is subtracted from the overall available budget in order to implement the conservation attributes describing the alternative and consequently cannot be used to implement other unspecified actions. Therefore, the budget constraint that each respondent considers when making a choice is not the respondent's private one, which depends on the respondent's income. Instead, it corresponds to a fixed and already available public budget amount that can be used for alternative purposes. Therefore, the WTP that we calculate for each of the conservation attributes in our case is interpreted as the WTP for an attribute from an available fixed public budget. This approach is somewhat related to other studies of preferences for public budget allocation. For instance, Kerr, Cullen, and Hughey (2010) consider a situation where a choice experiment is used to elicit preferences for changes in expenditure from a public budget. However, in their setting, changes in the amount allocated to the public budget directly impact the respondents' private budgets through taxes. In our case, the situation is more straightforward, as the public and private budgets are separated from each other, at least explicitly, as there is no mention of raising taxes or any other contributions to finance the project's budget.

4. Results

Table 3 provides descriptive statistics for the responses obtained from the questionnaire. A large percentage of the respondents knew the wetlands and performed some sort of leisure activity within the areas, especially in PPV. Very few respondents were dissatisfied about the current visual state of the wetlands, with the PPV being the one that most respondents were satisfied with. The sample included the same amount of women and men and the average age was 51. More than 50% of the respondents were working. Overall, both education and income levels were low. Only a small percentage of the sample was part of an organization related to nature conservation or contributed monetarily to any related cause.

The estimation results for three MNL models are presented in Table 4[2]. The first model corresponds to the basic MNL that captures preferences for the five attributes used in the CM. All coefficients are statistically significant. As expected, the four conservation attributes have positive estimated coefficients. The set of actions to increase the natural value of the PPV wetland was the most valued attribute, followed by the set of actions dedicated to BJ. In third place came the actions focused on the PP wetland. The actions, dedicated to environmental education, were the less valued ones. As expected, the monetary budget attribute, BUDGET, has a negative estimated coefficient, meaning that respondents prefer alternatives where the implementation of the proposed attributes is less costly and therefore leaves more money available to support the implementation of other unspecified projects.

The second model adds an alternative specific dummy variable for the BAU case (Table 4). The aim is to capture a tendency of the respondents to prefer alternatives A and B, regardless of the level of their corresponding conservation attributes, to the BAU alternative. The BAU dummy variable comes out to be statistically significant and with a negative coefficient. This result suggests that respondents have a clear

Table 3. Descriptive statistics for the sample ($n = 300$).

Variables	PPV	BJ	PP	All
KNOWLEDGE – Percentage of respondents that know the wetlands	100%	81%	67%	64%
FREQUENCY – Percentage of respondents that visit the wetlands at least 4 times per year	97%	74%	59%	–
LEISURE – Percentage of respondents that use the wetland for ludic activity	90%	63%	56%	
SATISFACTION – Percentage of respondents that are:				
Unsatisfied when looking at the wetlands	6%	6%	4%	
Indifferent when looking at the wetlands	5%	37%	47%	
Satisfied when looking at the wetlands	89%	57%	49%	
DISTANCE:				
Average distance to the wetlands (km)	4	5	4	
Minimum/maximum distance to wetlands (km)	0.2 / 8.8	1.0 / 9.6	0.1 / 8.5	
AGE: Average – 51; Minimum – 18; Maximum – 86				
GENDER: Male – 50%				
EDUCATION: Higher education – 12%; Upper-secondary level – 21%; Basic level – 66%; Other – 1%				
OCCUPATION: Working – 58%; Studying – 3%; Unemployed or retired – 38%; Other – 1%				
INCOME: Monthly income$e < 600€$ – 55%; [600€ – 1000€] – 22%; [1001€-1500€] – 15%; >1500€ – 8%				
NGO: Member of a nature conservation organization – 2%; Monetary contribution for nature conservation – 4%				

preference for allocating the budget to any set of pre-specified conservation actions that promote the wetlands in contrast to leaving the budget open to support other projects which are not yet specified.

Finally, in order to capture eventual heterogeneity in the respondents' preferences, we further extend the MNL model by including additional explanatory variables. The wetland-specific variables are included in the model as interactions with each of the three corresponding site attribute variables. The socio-demographic variables are included as interactions with the monetary attribute BUDGET variable. A model, including all possible interactions, was developed and many of the variables came out as not statistically significant. Therefore, we went through a process of backward elimination of non-significant variables until all remaining variables were significant at the 1% level. Estimation results for the final selected model appear as the third model in Table 4. The results show that the distance to the wetland has a significant impact on the WTP. As expected, the higher the distance to the areas the lower the WTP. On the other hand, the respondents who visit the PPV and BJ more often are willing to allocate a larger budget for the conservation of these sites. The fact that respondents did some leisure activity in these two wetlands also had a positive impact on the WTP for

Table 4. Estimated multinomial logit model for Paul da Praia wetland CE exercise.

Variables	Model 1	Model 2	Model 3
PPV actions	2.459 (0.020)	2.365 (0.028)	1.032 (0.104)
BJ actions	0.712 (0.019)	0.610 (0.028)	0.530 (0.066)
PP actions	0.458 (0.018)	0.377 (0.025)	0.816 (0.049)
EDU actions	0.190 (0.018)	0.098 (0.027)	0.131 (0.028)
BUDGET	−0.485 (0.024)	−0.619 (0.038)	−1.165 (0.097)
BAU		−0.343 (0.073)	−0.314 (0.076)
DISTANCE × PPV			−0.108 (0.007)
DISTANCE × BJ			−0.046 (0.008)
DISTANCE × PP			−0.067 (0.007)
FREQUENCY × PPV			0.780 (0.084)
FREQUENCY × BJ			0.163 (0.044)
LEISURE × PPV			1.253 (0.046)
LEISURE × BJ			0.424 (0.040)
AGE × BUDGET			0.007 (0.002)
EDLEVEL × BUDGET			0.451 (0.051)
Log-Likelihood	−15,478.5	−15,467.5	−14,663.2
AIC	30,967.0	30,947.1	29,356.5
N. Obs.	1500	1500	1500

Note: Standard errors appear in parentheses. All the estimated coefficients in the three models are statistically significant at the 1% level.

the conservation actions on these sites. For PP, the frequency of visits and the practice of leisure activities were not statistically significant. Finally, the interactions between the BUDGET and AGE and between BUDGET and EDLEVEL (i.e. education level) have positive coefficients, implying that older and more educated respondents have a higher overall WTP for the four conservation attributes.

Table 5 presents the estimated budget allocation obtained for the two first MNL models in Table 4, the basic MNL model, and the MNL model including the BAU dummy. In line with the coefficient estimates, the most valued attribute is the PPV, followed by BJ and PP, with the EDU attribute being the least valued one. Table 5 also presents the EU-LIFE project budget allocation to the four conservation actions. We note that the estimated WTP for the PPV, BJ, and PP attributes in the two MNL models considered are all above the actual EU-LIFE project budget amount allocated to each of these actions. In contrast, the EDU attribute, which was the action to receive the highest budget within the EU-LIFE project, has the lowest WTP, which is actually below its budget allocation.

5. Discussion

5.1. The relevance of nature conservation

The results shown in Table 4 demonstrate that the BAU variable (included in models 2 and 3) is statistically significant with a negative coefficient. This variable captures the relevance of the reference situation, corresponding to the case where none of the specific nature conservation actions included in the EU-LIFE project are undertaken. Therefore, respondents preferred to have any of the project's actions implemented instead of a situation where the budget was used for other purposes. This indicates the value of the overall project. In addition, it shows a preference for projects with well-

defined actions instead of having public money available for unspecified interventions (possibly in other areas, not necessarily related to nature conservation).

Looking in detail at the coefficients in Table 4, we conclude that the most valued actions are those targeting the ecological improvement of PPV, followed by the naturalization of BJ and the zonal planning intervention in PP. Finally, the actions dedicated to monitoring, dissemination and environmental education. Guimarães *et al*. (2014), although focusing on the birdwatcher population, also detected the importance of PPV and PP, as well as less importance for environmental education activities.[3]

In the past, the decline and fragmentation of Terceira wetlands was a result of lack of care by the local population (Guimarães *et al*. 2013); nonetheless, the results attained in this study indicates that the present is brighter. All the defined actions are valued by citizens, even more so for those dedicated to increase the wetlands' environmental conditions. We already knew that the areas were highly valued by birdwatchers (Guimarães *et al*. 2014). The present study brings an important dimension to the discussion by revealing that even those citizens who do not use the areas for birdwatching activities have an interest in preserving and enhancing these values. Similar to the results presented in Guimarães *et al*. (2014), the actions focused on environmental education and awareness are not a priority for local citizens. Yet, Table 4 shows that those who frequently visit the wetlands are more willing to allocate budget to one of the project options. Therefore, we can conclude that being close and using the areas has a positive effect on the valuation of the wetland. Although the less valued subproject was the one dedicated to monitoring, dissemination and environmental education about the wetland, results indicate that these actions will have a beneficial impact on the wetlands recognition and valorization. Other studies have arrived at similar conclusions (Grilli, Notaro, and Campbell 2018; Jensen and Olsen 2019). Direct nature experiences influence environmental preferences, even when these experiences occur during childhood (Jensen and Olsen 2019). Grilli, Notaro, and Campbell (2018) concluded that familiarization with the characteristics and habits of wildlife can produce a positive effect on nature conservation and the availability to support any protection and conservation plans. Our results also provide empirical evidence of such an effect.

5.2. Choice modelling, nature conservation, and decision making

The fact that the four non-monetary attributes were all significantly positive in all models (see Table 4) led us to conclude that overall the respondents consider that each specific action of the project adds value to it. However, the WTP results presented in Table 5 show that there are substantial differences between the EU-LIFE project's budget allocation to each of the proposed actions and respondents' elicited amount. In particular, the actions that received the highest budget within the EU-LIFE project had the lowest WTP. This result suggests that the CM approach could inform local conservation policy by selecting the EU-LIFE actions preferred by local citizens.

By conducting an ex-post CM with local citizens our study likely uncovered well-defined preferences encompassing less uncertainty in comparison with an ex-ante CM survey. Regier, Sicsic, and Watson (2019), applying CM, observed that the choices undertaken by respondents with higher certainty variability are more according to the preferences concept as defined by the economic theory underpinning CM. These authors' findings highlight a research gap that could be fulfilled by conducting the CM

Table 5. Estimated WTP and actual EU-LIFE budget allocation amounts.

	WTP for Model 1		WTP for Model 2		Actual EU-LIFE Budget Allocation	
Attributes	Amount	%	Amount	%	Amount	%
PPV actions	5.07	64	3.82	62	0.28	21
BJ actions	1.47	19	0.99	16	0.33	24
PP actions	0.94	12	0.61	10	0.24	17
EDU actions	0.39	5	0.16	3	0.53	39
Extra to avoid BAU	–	–	0.55	9	–	–

Note: Amounts are in million euros. The percentage provides an indication of the weight of each attribute in the overall budget of the LIFE project for the 2 models and in regards to the actual budget.

survey both ex-ante and ex-post to the local citizens, as a way to better understand their ex-ante information needs and how that influences their choices.

Another important result was the statistically significant and negative sign for the monetary attribute BUDGET, meaning that respondents' give less support to projects that provide the same amount of attributes but with an increased budget. This result supports the modification of the usual CM monetary attribute from an individual and private tradeoff to one that is not only public but also collective. Hence, SP methods might be able to cope with one of its major limitations, the individual nature of the preferences and its inability to account for the collective dimension involved in most of the decisions involving nature and biodiversity conservation policies (Niemeyer and Spash 2001; Vargas *et al*. 2017). Our study shows how CM can be used not only to assess the overall economic value of a nature conservation project but also to explore preferences at the level of the concrete actions being funded. Other studies also favor the use of CM, as it allows a finer valuation of environmental goods and services as they are defined in terms of specific attributes (Adamowicz *et al*. 1998; Bateman *et al*. 2002; Hanley *et al*. 1998; Cerda, Ponce, and Zappi 2013), uncovering relevant information for evaluating policy instruments (Perrings *et al*. 1995; Hanley *et al*. 2003; Cleland, Rogers, and Burton 2015). The CM allows the acquisition of the level of detailed information needed; it is a user-friendly tool that, when well designed, can elicit preferences in a simple, visually attractive and straightforward manner.

Finally, the results also indicate that the CM is useful not only ex-ante but also for the ex-post evaluation of a project. Some of the actions included in the questionnaire were already visible at the time of its application and this did not hinder the capacity of respondents to express their preferences. Although the CM is most favored due to its flexibility and hypothetical character for ex-ante judgments (Mitchell and Carson 1989; Kolstad 2000; Hanley, Mourato, and Wright 2001), our results indicate that its ex-post application might be superior in that respect, given the probability of respondents better defined preferences, enabling their consistent aggregation for policy purposes.

5.3. How the study findings can support improved environmental management?

In the context of decision-making at a local level, such as a municipality, policy makers add to the process of decision the needs and worries of residents (Jacobs *et al*. 2018; Laurans and Mermet 2014; Guimarães *et al*. 2014). There is a closer connection

between local governments and voters that justifies their governing positions. Our study provides scientific evidence that local residents value their most unique natural assets, which in this case are the wetlands this study focuses on. Our findings support future deliberative processes of public fund allocation to nature conservation at the municipal level.

The evidence shows that contact and understanding of the wetlands ecological system positively influences residents' choice to allocate public money for their conservation. Such findings are also key to future decision-making, since they can support public budget allocation for actions that increase public awareness of the wetlands, their use for usufruct, as well as the knowledge of residents regarding ecological status and conservation needs.

5.4. Limitations and recommendations for future research

Our findings suggest that conducting ex-post CM might overcome one of the limitations commonly pointed out to SP methods, which relies upon the assumption of observing well-defined preferences able to be consistently aggregated for environmental cost benefit analysis (ECBA) (Sagoff 1998; Niemeyer and Spash 2001). Further research would be needed encompassing other publics, besides local citizens, to confirm ex-post CM as a reliable tool to inform ECBA for policy use.

Future empirical studies are also necessary to understand the possible generalization of our results regarding the shift of the CM monetary attribute from an individual and private tradeoff to one that is not only public but also collective. Yet studies of budget allocation using CM also show promising results, including the need to pay attention to how opportunity costs are presented to assure that tradeoffs are well understood (Morrison and MacDonald 2011; Remoundou *et al*. 2014; Ozdemir, Johnson, and Whittington 2016). Despite the necessary precaution and further developments, CM can became an important tool to improve deliberative processes.

6. Conclusions

We suggest that CM can be an adequate tool to assess the alignment between nature conservation actions, public expenditure and citizens' preferences.

Further research, comprising both ex-ante and ex-post CM emerges as insightful to understand citizen's information needs and how that influences their preferences regarding the expenditure of public money in alternative environmental and non-environmental actions.

Finally, our study provides empirical evidence that the evaluation of ecosystem goods and services is influenced by the contact that citizens have with them. Therefore, environmental education, access to and use of ecosystem goods and services should be encouraged to increase understanding and care.

Notes

1. In what follows, the BUDGET attribute will be measured in million euros.
2. All estimations were performed using the NLOGIT Version 4.0 statistical software.
3. The work developed by Guimarães *et al*. (2014) did not focus on the BJ area. Therefore, we are unable to compare our results regarding this specific wetland.

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