

Drovers' Roads as Environmental Assets: Use Value for Recreational Purposes of the *Cañada Real del Reino de Valencia*

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Abstract

Drovers' roads have been a key part of transhumant pastoralism for decades, being the routes on which to drive livestock, and it is for this reason that they are protected by Spanish law, specifically Law 3/1995, by which they were declared public goods. At the same time, their particular nature also means that they also possess characteristics which are typical of other types of public goods; therefore, in order to estimate their value, market-based techniques cannot be used. This study centres on a project for the restoration for recreational purposes of the *Cañada Real del Reino de Valencia*, a drovers' road in the Valencia region of Spain. In order to establish its economic value, the contingent valuation method has been used: this is the most commonly used technique for the valuation of non-market goods and it is widely attested in the economic literature, being used in a large number of different settings. Assuming a useful life of 25 years and a social discount rate of 5%, the value of the *Cañada Real del Reino de Valencia* has been estimated at €441.82 million, indicating the value which society places on the drovers' road. This estimation may assist in improving the efficiency of public spending policies.

Keywords

Drovers' Roads, Contingent Valuation Method, Willingness to Pay, Spike Model

1. Introduction

Besides contributing to the improvement of people's quality of life and welfare, economic development has also

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led to the intensive use of some natural resources, leading to the deterioration of these and accelerating the process of the exhaustion of them, and it has also triggered major changes in production techniques [1]. These changes are clear to see in the food production industry and especially so in the livestock sector: in Spain transhumance has been used as a production technique for hundreds of years, and, in order to support this system, this has led to the creation of an extensive network of drovers' roads which have been used for moving livestock from winter pasture to summer pasture, taking advantage of the varied topography of the Iberian Peninsula [2]. The decline in economic importance of the sector, together with developments in means of transport and modern livestock feeding techniques, has led to the almost complete abandonment of the traditional use of the roads [3].

These drovers' roads now constitute a major environmental asset, as well as being part of the country's cultural heritage. This important resource is currently in a poor state; their restoration could enable government agencies to achieve various environmental objectives, as drovers' roads fulfil functions which are ecological [4] as well as being part of the country's cultural heritage. It would also be desirable for their restoration to form part of sustainable development programmes for rural areas, in which the drovers' roads could once again perform a useful function, either as a rural communication system or as a resource which would enable additional economic activities in these areas to be undertaken. The functional utility of drovers' roads would principally focus on new recreational uses, facilitating the provision of a more diverse range of services, which would in turn boost rural development.

Due to their inherent characteristics and the protection provided to them under Spanish law, specifically article 2 of Law 3/1995 on Drovers' Roads, these centuries-old tracks can be considered to be public goods. This status is reinforced by the absence of restrictions on accessing these roads, the lack of a market in which their value can be established and because, in principle, no kind of exclusion can be placed on the use of it, in a similar way to other types of public road. Furthermore, most of Spain's extensive network of drovers' roads has not been surveyed nor its boundaries marked, making it impossible to demand any fee for the use of it. The restoration of drovers' roads for recreational purposes will require major public investment which can only be socially justified by the value which society places on the environmental asset.

The aim of this study is to estimate the social benefits which would result from the hypothetical restoration of the *Cañada Real del Reino de Valencia* (CRRV). This drovers' road crosses the province of Valencia from east to west, connecting two areas with contrasting levels of economic development: the interior or mountainous area, whose economy is mainly agriculture-based, and the coastal area, which is more developed and whose economy is mainly based on the services sector and to a lesser extent on industry.

The restoration project of the CRRV would fall within the framework of Law 3/1995, whose purpose is to preserve the drovers' roads due to their great historical and cultural value and also their contribution to the conservation of the natural environment and biodiversity. The restoration programme of the CRRV could also contribute to reducing the economic development gap between the two areas it connects. Therefore, the information obtained could be of great use for public decision-making processes concerned with the more efficient implementation of environmental policies, something which is especially timely given the current shortage of resources.

The rest of this article is structured as follows. Section 2 describes the environmental asset to be valued. Next, in Section 3, the hypothetical market design and survey process is detailed, along with the theoretical framework on which the valuation of the environmental goods is based. Section 4 presents the estimated models and the results obtained. Finally, in Sections 5 and 6 the results are aggregated and the conclusions are presented.

2. Case Study: The *Cañada Real del Reino de Valencia*

Drovers' roads are routes or tracks along which livestock has traditionally been driven. Their use for this purpose was an essential part of the livestock farming process for hundreds of years in the Iberian Peninsula and it is for this reason and it have made a major contribution to economic development and land use planning [5]; for the whole of Spain, the total length of these roads is more than 125,000 km, which is ten times the length of the rail network. The surface area covered by them amounts to 425,000 hectares, equivalent to 1% of Spain's total surface area [6].

In addition to their original economic function, drovers' roads have come to play an essential role in nature conservation and biodiversity. Examples of this include: the part they play in supporting the maintenance of indigenous breeds and extensive livestock farming; their undeniable ecological value (as ecological and biological

corridors, or encouraging the ecological coherence of the Natura 2000 network); historical and cultural value (know-how, folklore, gastronomy, etc.); and their value as for recreational uses and tourist attractions [7]. These characteristics provide further support to the fact that the drovers' roads are public goods. However, the drovers' roads are currently in a state of abandonment, intrusion and unlawful occupation, due to both public and private activity. In order to avoid further deterioration, the regular use of the roads should be encouraged. Although the ideal situation would be for transhumance to continue, reality obliges us to propose other compatible uses. New leisure or ecotourism-related uses of drovers' roads and paths could attract new resources with which to reactivate the economy, as the traditional economic system linked to the drovers' roads is close to disappearing [*El libro blanco de la trashumancia* (2011)]¹.

Drovers' roads represent an excellent platform on which to base natural resource planning and management, enabling the environment to be integrated into farming systems and also the new uses arising from an increase in the demand for the enjoyment of the environment [8]. Although the roads came into being through transhumance, they could also be used for activities related to such enjoyment: hiking, bicycle touring, horse riding holidays, short walks, or running, amongst others.

The CRRV, as it descends towards the Mediterranean coast, moves through landscapes of great natural beauty and environmental interest, such as the Sierra de la Bicuerca, the Atalaya del Sabinar, the Sierra de la Cabrera, or the Hoces del Cabriel and the Albufera de Valencia. This means that a restoration project of the CRRV could combine its environmental function with tourism and recreational activities, thereby contributing to the economic development of some of the areas the CRRV passes through (Figure 1).

The current situation of the deterioration and abandonment of the CRRV contrasts with the legal protection that Law 3/1995 provides to drovers' roads, as it declares them to be public goods, which cannot be taken away by proscription, be seized or transferred. It is currently impossible to travel down the complete route of the CRRV, due to there being numerous encroachments throughout and its general state of abandonment. At the western entrance, in the municipality of Camporrobles, its state is such that it is difficult to make out the drovers'

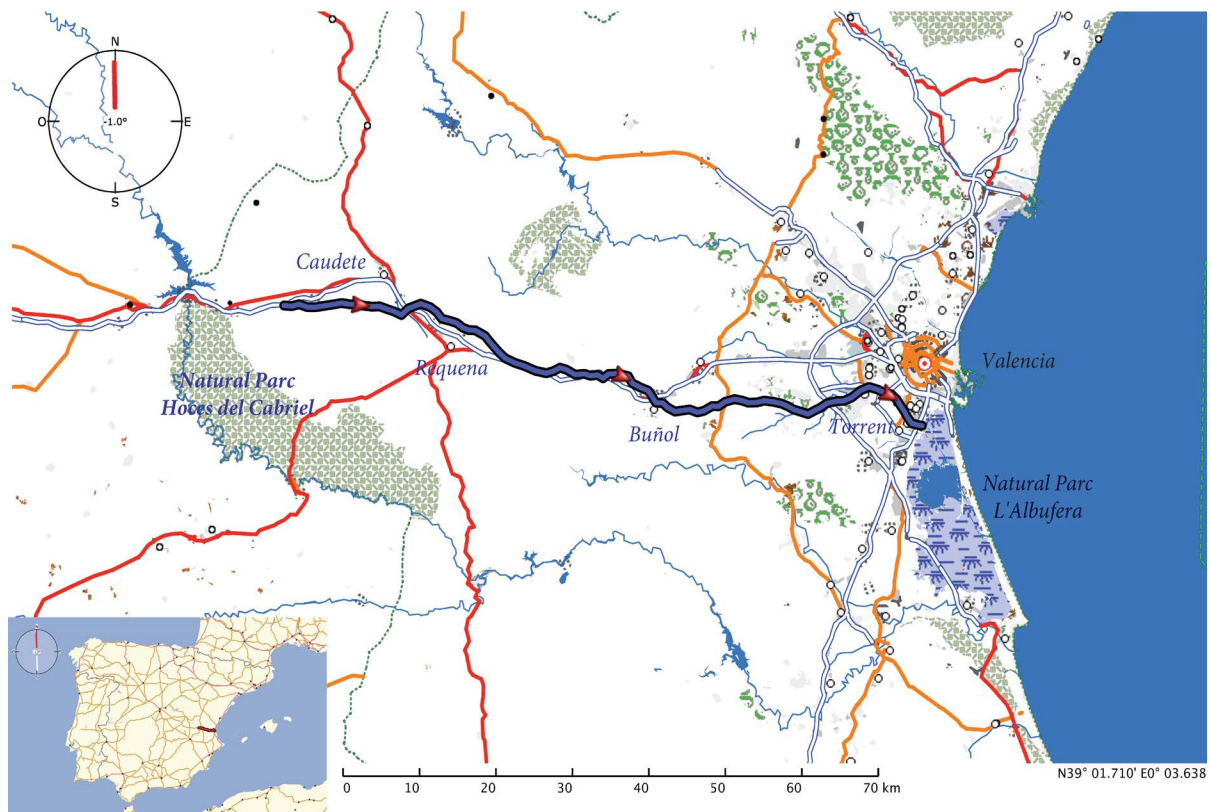


Figure 1. The extent of the Cañada Real del Reino de Valencia.

¹<http://www.agro-alimentarias.coop/ficheros/doc/03495.pdf>

road from the surrounding scrubland. Further along the road, in the section running between Caudete de las Fuentes and Buñol, there are a number of encroachments, principally by private farms which have planted typical crops for this part of the province, such as vines and almond or olive trees. Encroachments of this kind are not, in theory, great obstacles to restoring the CRRV's original width of 75.22 metres. After the municipality of Buñol and up to the Albufera de Valencia lagoon, there are a large number of encroachments whose nature is both public (communication infrastructures) and private: not agriculture in this case but a wind-farm and a quarry. This greatly hinders the identification of the road and future attempts to restore it. This de facto situation and the changes to livestock farming technology have led to this situation in which the use of the drovers' road is minimal, with only two or three herds coming through per year.

The state of the CRRV varies from one municipality to the next: those whose municipal boundaries were set before 1960 preserved the original width of the road at 90 *varas* (75.231 meters or 82.2726 yards) a *vara* being slightly smaller than a yard), whereas those boundaries which were set later reduced its official width, probably due to the decrease in the size of livestock traffic in more recent years.

3. Theoretical Framework

In today's society, reliable monetary estimates of the value of environmental goods and services are becoming ever more necessary, due to their importance in ensuring the welfare of the population and the negative effects that the loss or degradation of such resources could have [9]. However, although improvements to the conditions of environmental assets brings social benefits in the form of increased availability of goods and services, such improvements also incur costs, thereby consuming limited resources for which alternative uses could be found. This is why estimates of the value of these environmental resources are needed [10].

Direct evidence of the need to place monetary values on natural and environmental resources can be seen in environmental accounting and the implementation of public spending policies which seek economic and social efficiency [11]. Thus, those public institutions charged with the preservation of environmental assets—in Spain, the *Ministerio de Agricultura, Alimentación y Medio Ambiente* (Ministry for Agriculture, Food and the Environment) at a national level, and in the *Comunitat Valenciana* (the Valencia region), the *Consellería de Infraestructuras y Medio Ambiente* (the Department for Infrastructures and the Environment)—require indicators of the monetary value of the environmental assets. The estimation of the value of such assets provides society and the authorities with indicators which can improve the efficiency of public investment projects and resource management, and thus they also encourage sustainable development and territorial planning.

In order to perform valuations of natural resources, researchers have developed different methods, including those which are based on stated preferences. These methods establish a valuation by proposing hypothetical markets and, using these, one can record the economic valuation which individuals place on the environmental good in question. Various studies have used a particular method of this type, known as contingent valuation [12], and the use of this approach is becoming more and more widespread in the field of valuation, both as a decision-making tool and in the calculation of compensation for environmental damage [13]-[15].

3.1. The Contingent Valuation Method

The contingent valuation method (CVM) is suitable for the valuation of public environmental goods in the specific context of a cost-benefit analysis [16] [17]. The method enables the estimation of the use value, the non-use value (the existence value or option value), or both, of natural resources [18]. In a typical contingent valuation survey, a representative sample of the relevant population is asked about their willingness to pay (WTP) for an improvement in environmental quality or their willingness to accept (WTA) in order to allow a worsening in environmental quality. In this way, the values obtained represent the economic benefits (or costs) of the proposed change and they can be aggregated and used to undertake a cost-benefit analysis in order to establish what the social benefits (or costs) of a public policy would be, when this would lead to an improvement (or deterioration) of general welfare.

As with any CVM, this approach has been the subject of controversy, receiving much criticism in the academic literature [19]-[22]. Carson *et al.* (2003) [13] maintains that one of the advantages of the method is that it evaluates the WTP of each individual with regard to changes in environmental quality compared against the status quo. Furthermore, since the data are captured from a hypothetical market by means of an interview, the CVM enables the benefits of environmental services to be quantified more effectively [19] [23] [24].

In Spain, the method has been used in a variety of studies in order to place a value on a range of different natural settings, particularly for recreational uses. Studies have focused on, for example, the valuation of nine protected areas in Spain (ParqueSobira, Moncayo, Gran Canaria, Motril, Mongrague, Albufera, Bertiz, Ordesa, and Posets-Maladeta) [25], the *Desierto de Las Palmas* area of the *Comunitat Valenciana* [26] and on the improvements resulting from the new uses of natural settings, such as for recreational activities [27]. The CVM has also been used in other studies to quantify the use of public parks by the inhabitants of big cities [28].

Research on drovers' roads as environmental assets has focused on the environmental functions that they undertake with regard to the practice of transhumance: studies include Cazorla Montero *et al.* (2004) [6], Ruiz and Ruiz (1986) [4] and Rodriguez (2004) [3]. However, there is a clear lack of research on the valuation of drovers' roads from an economic perspective both with regard to both use and non-use values.

In contrast, the recreational use value of infrastructures with similar characteristics to drovers' roads has been examined in other countries. For example, Morris *et al.* (2009) [29], using the "choice experiment" technique for the valuation of the attributes of Public Rights of Way (PRW), demonstrated that the PRWs of England and Wales possess significant existence and legacy values. This study also demonstrates the fact that the maintenance of the PRWs encourages rural tourism, improving public health and providing a boost to the economy.

3.2. Econometric Model

Our objective was to determine the value that society places on a project for environmental improvement that would enable a section of the CRRV to be used for recreational purposes. Therefore, following the recommendation made by NOAA² [30] and the theoretical arguments of Mitchell and Carson (1989) [16], we used WTP for the estimation of this value. Carson *et al.* (2003) [12] also supports the use of WTP when the question concerns the acquisition of an environmental resource which the person being asked does not currently have or possess legal entitlement to—which is our case here. Part of the survey was devoted to acquiring data on WTP: first of all, pictures of suitable uses of the drovers' roads were displayed while the interviewer read the description of the CRRV restoration project; afterwards, a discussion of the issues took place, which provided us with the data for the models and the WTP was thus obtained.

For many public policies, the use of questions on WTP may give rise to a considerable number of zero responses [31]. The Theory of Demand explains zero consumption in terms of corner solutions in the case of substitute goods: either for income-related reasons or because consumption of it does not increase utility for the consumer. On the other hand, a zero response may also represent a form of protest by the interviewees, and thus the theoretical framework must enable us to distinguish between the zero responses which represent consumer preferences and those which are protest-zero responses, so that they can be analysed accordingly. In our study, there was a zero WTP for 52% of our interviewees, with 32.5% giving a protest response for various reasons (they already pay enough taxes, distrust of the government, or lack of information). The processing of zero responses, especially those which are protest responses, can have a major impact on the WTP measurements. Traditionally, such responses have tended to be excluded from the sample, but such an approach may be problematic if the exclusion of the protest responses leads to a selection bias [32]: there may be a systematic relationship between the act of protesting and the decision to participate in the market. To deal with this problem, a two-pronged solution was adopted. On the one hand, assuming that a significant part of the sample would have no preferences with regard to the environmental good to be valued, a spike model was used [11]; on the other, in order to allow for the possible problem of a selection bias arising when excluding protest responses from the sample, an estimation was carried out using a bivariate probit selection model [33].

Following Kristrom (1997) [11], in the model we posit an individual who is asked if he or she wishes to pay a certain amount A in order for the project to be undertaken. The project is described as providing an improvement to environmental quality of q_0 to q_1 , with $q_1 > q_0$. For our case study concerning the CRRV, the improvement in environmental quality involves making a section of the drovers' road suitable for leisure activities and strengthening its role as an ecological corridor. The WTP for this change is defined as follows:

$$V(Y - \text{WTP}, q_1, z) = V(Y, q_0, z) \quad (1)$$

where $V(Y, q)$ is the function of the indirect utility of the consumer, z is a vector of the socioeconomic characteristics and Y is the consumer's income. We assume that different individuals will have differing valuations

²The National Oceanic and Atmospheric Administration.

of the project, and therefore the probability that the WTP of an individual does not exceed amount A is expressed by:

$$P(\text{WTP} \leq A) = F_{\text{WTP}}(A) \tag{2}$$

where $F_{\text{WTP}}(A)$ is a continuous and non-decreasing function. Consequently, the expected WTP is:

$$E(\text{WTP}) = \int_0^\infty 1 - F_{\text{WTP}}(A) dA - \int_{-\infty}^0 F_{\text{WTP}}(A) dA \tag{3}$$

In order to estimate $F_{\text{WTP}}(A)$, when a dichotomous question is used, the price offered must vary for the whole sample and so a vector with different price-levels is used for each sub-sample. In this model, the WTP distribution function is assumed to be as follows:

$$F(A) = \begin{cases} 0 & \text{si } A < 0 \\ \frac{1}{1 + e^\alpha} & \text{si } A = 0 \\ \frac{1}{1 + e^{\alpha + \beta A}} & \text{si } A > 0 \end{cases} \tag{4}$$

This model uses two valuation questions. Firstly, the interviewee is asked if he or she wishes to make an economic contribution to the CRRV improvement project. Secondly, if the first question is answered affirmatively, a price A is offered, the payment of which can be accepted or rejected. Thus, for each individual, two variables are obtained: IO_i and IA_i . The first variable indicates whether the individual wishes to enter the market or not for this environmental good:

$$IO_i = \begin{cases} 1 & \text{if } \text{WTP} > 0 \\ 0 & \text{if } \text{WTP} \leq 0 \end{cases} \tag{5}$$

And in the second question, a price A is offered to those individuals who have decided to enter the market ($IO_i = 1$):

$$IA_i = \begin{cases} 1 & \text{if } \text{WTP} > A_i \\ 0 & \text{if not} \end{cases} \tag{6}$$

One of the most widely used implementations of estimations using the spike model is based on the parametric method using the likelihood function and the logistic function. Once the maximum likelihood estimation has been made, the mean WTP of the simple spike model can be obtained as follows (if β is positive):

$$E(\text{WTP}) = \frac{1}{\beta} \ln[1 + \exp(\alpha)] \tag{7}$$

Furthermore, in order to include the interviewees' socioeconomic characteristics, the model proposed by Hanemann (1984) [19] is used, also based on the random utility function of an individual which can be expressed by:

$$u_i(y_j, z_j, \varepsilon_{ij}) = v_j(y_j, z_j) + \varepsilon_{ij} \tag{8}$$

In order to see the impact of interviewee characteristics on WTP, the above model can be broadened through the use of explanatory variables. For this purpose, if the binary variable IA_i represents the (observed) response of the i th individual to dichotomous question of the contingent valuation, then the equation for the latent (unobserved) variable IA_i^* is:

$$IA_i^* = \alpha + \beta A_i + \lambda_1 X_{1,i} + \lambda_2 X_{2,i} + \dots + \lambda_M X_{M,i} + \varepsilon_{IA,i} \tag{9}$$

where $X_{IA} = \{X_1, X_2, \dots, X_M\}$ is a vector of explanatory variables as well as of the price A offered to the interviewee in exchange for the improvement of the environmental quality from q^0 to q^1 . With the introduction of this new variable IA^* , the decision-making rule for each individual i regarding whether or not he or she accepts price A can be expressed by:

$$IA_i = \begin{cases} 1 & \text{if } IA_i^* > 0 \\ 0 & \text{if } IA_i^* \leq 0 \end{cases} \quad (10)$$

In the same way, it may be assumed that, behind the decision to participate in the hypothetical market, there is a latent variable IO_i^* defined by the following equation:

$$IO_i^* = \gamma_0 + \gamma_1 V_{1,i} + \gamma_2 V_{2,i} + \dots + \gamma_K V_{K,i} + \varepsilon_{IO,i} \quad (11)$$

where $X_{IO} = \{V_1, V_2, \dots, V_K\}$ is also another vector of explanatory variables which is not necessarily different from XIA. In this case, the decision-making rule is:

$$IO_i = \begin{cases} 1 & \text{if } IO_i^* > 0 \\ 0 & \text{if } IO_i^* \leq 0 \end{cases} \quad (12)$$

The error terms are assumed to be distributed as a normal bivariate function with a correlation parameter ρ . That is: $(\varepsilon IA, \varepsilon IO) \sim \text{BVN}(0, 0, 1, 1, \rho)$. Therefore, with the introduction of these two new decision-making rules, the spike model becomes a bivariate selection model.

$$\begin{cases} IO_i = 0 & \text{if } IO_i^* \leq 0 \\ IO_i = 1 & \text{if } IO_i^* > 0 \end{cases} \rightarrow \begin{cases} IA = 1 & \text{if } IA_i^* > 0 \\ IA = 0 & \text{if } IA_i^* \leq 0 \end{cases} \quad (13)$$

3.3. Design of the Hypothetical Market

The questionnaire was drafted according to the guidelines drawn up by a group of experts chosen by NOAA for the purpose of obtaining valuations which are reliable and useful for public decision-making processes. It was also shown to experts from the Valencia region's Conselleria de Infraestructuras y Medio Ambiente and groups who use drivers' roads, so that any errors or flaws it contained could be rectified. Two pilot studies were carried out (comprising of one with 100 and another with 120 interviews) in order to verify that the interviewees understood the proposed valuation scenario, that the information provided was appropriate and that there were sufficient illustrative material for the interviewee to respond to the questionnaire.

With the final version of the questionnaire, 356 interviews were undertaken during April and May 2010 in the city of Valencia and in the municipalities in the vicinity of the CRRV: Fuenterrobles, Camporrobles, Caudete de las Fuentes, Utiel, Requena, Siete Aguas and Buñol. The distribution of the interviews was such that the sampling parameters were proportional to population size of these locations, thus ensuring the representativeness of the sample. In this way, 56% of the interviews took place in the city of Valencia and its metropolitan area, and the remaining 44% in the municipalities the CRRV passes through.

The verbal description of the valuation scenario was accompanied by specific set of images with which to demonstrate the restoration of the CRRV, along with a reference map. The aim was to ensure full comprehension of the valuation scenario, by maintaining the interviewee's attention [12].

The WTP question was carefully formulated so that the valuation scenario would be credible and realistic. For this purpose, the method and frequency of payment was clearly specified: a surcharge added to the impuesto de bienes inmuebles (IBI, an annual tax on property collected by the local government) over a period of four years. The advantage of a surcharge on a tax such as the IBI, instead of the entrance fees which are usually used in the valuation of natural settings, is that it is coercive and minimizes the strategic bias. Also its implementation is more straightforward, due to the impossibility of applying the principle of exclusion on the use of the drivers' roads.

The format of the question used was that of the simple dichotomous choice or referendum-type question [34], given the advantages of this in comparison with other formats which are more likely to elicit protest responses. Following the process established by Cooper (1993) [35], six different prices were used for the dichotomous question (10, 20, 50, 80, 100 and 150 Euros). The structure of this price vector was based on the responses given to the open-ended question used in the pilot studies. The challenge faced by researchers in seeking to reduce or eliminate strategic bias is that of finding the right balance between a achieving a sufficiently wide price vector and maintaining the prices within a credible range [36].

As is normally the case in studies of this type, the questionnaire consisted of three parts. In the first of these, the valuation scenario was presented to the interviewees and they were also asked at this point about the importance they placed on this project and their usage expectations of it, were the project to be carried out. In the second part, after stating that the project would be publicly funded by means of a surcharge on the IBI property tax, the interviewee was asked about their willingness to pay. In order to identify the protest responses and distinguish these from the “genuine” zero responses, another question was then asked concerning the reason why the interviewee was not willing to pay. The third and final part of the questionnaire concerned the socioeconomic characteristics of the interviewees (age, family income, education, size of the family unit, etc.) in order to obtain a series of variables which would allow us to undertake a subsequent validation of the results from the theoretical point of view, by means of a function value estimation.

For those individuals who demonstrated a desire to enter the market (**Table 1**), willingness to pay at the price offered decreases as the price increases, as would be expected.

Of the total number of individuals interviewed, 52.26% stated that they were not willing to pay for the project to restore the *Cañada Real del Reino de Valencia* for the purposes of tourism. 19.49% of the total interviewees were identified as being “genuine” zero responses and 32.77% were identified as being protest-zero responses. The protest responses were also analysed in terms of the municipalities the interviewees were from, but no significant differences were found here. The proportion of protest responses received is similar to that reported in previous contingent valuation studies [37].

4. Results

This section will detail the estimation of the mean WTP, including and excluding the protest responses and the analysis of the determining factors of the WTP, and address the possible presence of a selection bias deriving from the exclusion of the protest responses.

Table 2 displays the coefficients of the estimated models used to obtain the mean WTP. When all of the responses were included using the log it model, a negative WTP was obtained. This result may be attributed to the high percentage of protest responses obtained and also the fact that the model permits a negative WTP. However, the spike model divides the sample, separating those with a zero WTP from those with a positive WTP, making this model more suitable for samples in which a considerable number of zero WTPs are obtained; with this model a WTP of €48.73 was obtained.

Following the method described earlier, once the protest responses had been excluded, the models (logit, probit and spike) were estimated once more and positive WTP mean averages were obtained in all cases, also being larger in every case (€46.72, €46.84 and €67.99, respectively). However, as we have said, these values may be biased: we will consider the possible presence of a selection bias later.

In order to validate the results obtained, the next step was to analyse the determining or explanatory factors of the WTP by means of an equation which could predict the WTP with an acceptable explanatory power and with coefficients of the explanatory variables having the expected signs [13]. The explanatory variables used and the corresponding descriptive statistics are shown in **Table 3**. As we have said, the interviewees were asked two questions. With the first question, the aim was to discover whether the interviewees formed part of the market

Table 1. Willingness to pay at each price offered.

Price vector	Individuals expressing a desire to enter the market	Willing to pay	Unwilling to pay	% Yes	% No
10					
20	23	19	4	83%	17%
50	28	24	4	86%	14%
80	27	13	14	48%	52%
100	28	11	17	39%	61%
150	31	7	24	23%	77%

Source: compiled by the authors.

Table 2. Estimated models and WTP mean averages.

	Including the protest responses			Excluding the protest responses		
	Spike	Logit	Probit	Spike	Logit	Probit
α	-0.07585 (-1.604)	-0.17944 (-2.027)	-0.12277 (-2.274)	0.89983 (14.247)	0.76550 (7.105)	0.46774 (7.127)
β	0.0134 (20.273)	-0.01217 (-9.810)	-0.00719 (-10.098)	-0.01825 (20.094)	-0.01638 (-11.780)	-0.00998 (-12.266)
Mean WTP (€)	48.73	-14.74	-17.08	67.99	46.72	46.84
Standard deviation	2.55	-	-	2.90	4.06	4.11
Log-likelihood	1685.568	-1003.122	-1002.91	1172.913	-734.0023	-733.8979
N	356	356	356	240	240	240

Source: compiled by the authors.

Table 3. Descriptive statistics of the explanatory variables.

Variable	Description	Mean	Standard deviation	Minimum	Maximum
BID	Bid offered at 6 different values	68.79	48.36	10	150
EARNINGS	Net family income after tax, divided into 11 intervals, ranging from €0 to more than €5000 per month	3.51	1.76	1	11
JOBLESS	Variable indicating the employment situation of the interviewee (unemployed = 1)	0.15	0.36	0	1
NRESOURCES	Dummy variable indicating whether the interviewee totally agrees with the statement: "Natural resources must be conserved regardless of the cost".	0.48	0.1618	0	1
ENVIRONMENT	Dummy variable indicating whether the interviewee totally agrees with the statement: "We must all make a contribution if we want to protect the environment".	0.77	0.2366	0	1
CONCERNED	Dummy variable indicating whether the interviewee is concerned by the environment (concerned = 1)	0.71	0.45	0	1
NEWHABITS	Dummy variable indicating whether the interviewee totally agrees with the statement: "I would be willing to change my consumption habits to protect the environment".	0.50	0.50	0	1
FUSE	Dummy variable indicating the future usage expectations for the drovers' road (high level of usage = 1)	0.75	0.43	0	1
CITY	Dummy variable indicating whether the interview took place in Valencia or its metropolitan area or not (CITY = 1)	0.49	0.1692	0	1
EXISVAL	Dummy variable indicating whether the interviewee, besides the use value, is also concerned about the existence of this natural resource (existence = 1)	0.47	0.50	0	1
MANAGEMENT	Dummy variable concerning the interviewee's occupation (white-collar worker = 1)	0.23	0.42	0	1
STUDIES	Dummy variable concerning the interviewee's education (university-educated = 1)	0.16	0.37	0	1
ADMINISTRATION	Dummy variable indicating whether the interviewee totally agrees with the statement: "Government agencies are carrying out their duty to protect the environment correctly"	0.12	0.32	0	1

Source: compiled by the authors.

for the environmental good in question and, with the second, the interviewees who answered “yes” to the first question were offered a particular bid (or price). Therefore, as can be seen in **Table 4**, two bivariate probit selection models were estimated. In the first of these, the decision to participate in the market ($IO = 1$) is conditional on the decision not to protest ($NOPROTEST = 1$), while in the second case, the decision to accept the proposed bid ($IA = 1$) is conditional on the decision to enter the market ($IO = 1$). With regard to the first model, the selection equation explains the differences between the protest responses and the non-protest responses, and it also shows that there is a positive relationship between the probability of not protesting and the family earning of the interviewees (*EARNING*), the usage expectations of this environmental resource (*FUSE*), two variables related to the environmental interviewee interest (*NRESOURCES* and *CONCERN*), and the fact of being university-educated (*STUDIES*). Finally, for the interviews taking place in the city of Valencian or its metropolitan area (*CITY*), the probability of not protesting is lower: in other words, the probability of obtaining a protest response is higher. The second equation shows that the probability of agreeing to participate in the hypothetical market is also positively correlated with a set of variables concerned with environmental concerns (*NRESOURCES*, *ENVIRONMENT*, *NEWHABITS* and *CONCERN*). Also, if the interview took place in the city of Valencia or its metropolitan area, the probability of entering the market is lower. No statistically significant correlation between the error terms (ρ) was found, *i.e.* the decision to protest and to participate in the market are not correlated, and therefore the protest responses can be excluded from the sample because this does not lead to a selection bias.

The second model shows the decision to accepted the proposed price ($IA = 1$), once the individual has decided to enter the market ($IO = 1$). By analysing the coefficients of the selection equation, we can once more infer that the probability of entering the market is positively correlated with family income, with the four variables concerning environmental concerns (*NRESOURCES*, *ENVIRONMENT*, *NEWHABITS* and *CONCERN*) and with

Table 4. Selection bias models (bivariate probit selection).

Variable	Model 1		Model 2	
	Selection equation ($NOPROTEST = 1$)	Participation equation ($IO = 1$)	Selection equation ($IO = 1$)	Willingness to pay equation ($IA = 1$)
CONSTANT	-0.5927*** (-4.923)	-1.9567** (-2.464)	-1.9449*** (-8.376)	-1.5616*** (-4.761)
BID				-0.0190*** (-8.873)
INCOME	0.1493*** (6.519)	0.1105* (1.707)	0.1121** (3.076)	0.2691*** (6.796)
NRESOURCES	0.3949*** (5.327)	0.7196*** (3.912)	0.7057*** (6.606)	-0.8282*** (4.773)
ENVIRONMENT		0.4812*** (3.459)	0.5324*** (3.701)	1.1093*** (5.105)
NEWHABITS		0.2848** (2.272)	0.2743** (2.155)	0.8033*** (5.888)
CITY	-0.2110** (-2.892)	-0.3687** (-3.126)	-0.3359*** (-3.249)	-0.3837** (-2.949)
ADMINISTRATION				-0.4842 (2.594)**
FUSE	0.4111*** (4.656)	1.4372*** (7.021)	1.4674*** (11.287)	
CONCERNED	0.2482** (2.980)	0.4402** (2.801)	0.4182*** (3.291)	
STUDIES	0.3307** (2.816)			
JOBLESS			-0.3576** (-2.258)	-0.9174*** (-3.666)
EXISVAL				0.3976** (2.958)
MANAGEMENT				0.5608*** (3.208)
Log-likelihood		-1280.023		-742.7060
ρ		0.248		0.661**
N		307		214

Note: t-statistic in brackets; ***: 1% statistical significance; **: 5% statistical significance; *: 10% statistical significance.

the usage expectations of the environmental good. On the other hand, those interviewees who were unemployed (JOBLESS) or who stated that they lived in Valencia or its metropolitan area (CITY) have a lower probability of entering the market. The second equation is able to explain the decision to accept the proposed price taken by those interviewees who agree to pay higher taxes to fund the restoration of the CRRV policy. In this case, as one would expect, the higher the amount (BID) is, the lower the probability of its being accepted is. Another variable which also displays the expected sign is that of family income. Thus, the higher this is, the greater the probability of the proposed bid being accepted. In this respect, Hanley *et al.* (2009) [38] pointed out that the literature on the economic valuation of public goods clearly shows that there is a positive correlation between income and environmental improvements. As one would expect, once again, the variables concerning environmental awareness (NRESOURCES, ENVIRONMENT, and NEWHABITS) have a positive impact on the probability of accepting the proposed bid. Also, those interviewees who claimed to have a management job (MANAGEMENT) and who, besides use values, declared that they were interested in the existence (EXISVAL) of this natural resource have a greater probability of accepting the proposed bid. In contrast, being unemployed or living in Valencia or its metropolitan area has a negative impact on the probability of accepting the proposed bid. Finally, the variable ADMINISTRATION has a value of 1 if the interviewee declared that they totally agree with the statement that “government agencies are carrying out their duty to protect the environment correctly” and zero in the other cases: therefore, these individuals have a greater probability of accepting the proposed bid.

5. Aggregation of the Results

In order to quantify the social benefits of the project to restore the *Cañada Real del Reino de Valencia*, it is necessary to aggregate the individual valuations. In welfare economics, aggregation is always controversial because, as Bateman *et al.*, (2006) [39] have remarked, one of the key questions in this process is the extent of the market. This is consistent with Loomis (2000) [40], who state that for cost benefit analysis the individual measurements of welfare are secondary, with the criterion for social aggregation being decisive (by local area, region or country, etc.) due to its direct links to funding. In this study, the extent of the market was based on the number of homes in each municipality which the CRRV passes through. This criterion is justified by the fact that, in a study of this type, if the reference population had been that of the whole territory of the *Comunitat Valenciana*, then this would lead to an overestimation of the social benefits. Furthermore, it is also consistent with the manner of payment chosen, the surcharge to the IBI, the property tax collected by local (not regional) government.

The high number of zero WTP responses (52%) led to a negative mean WTP in the logit and probit models, as they include all of the responses. Although there is no consensus in the literature regarding how to resolve this problem, in this case we used the spike model, proposed by Kriström (1997) [11], in which it is assumed that many of the interviewees provide a zero WTP response because they do not place any economic value of the good in question because it does not form part of their utility function. Therefore, in order to be prudent and not overestimate the social benefits deriving from the restoration of this environmental good for recreational purposes, the mean average of €46.72 was chosen for the WTP, this having been arrived at by applying the spike model and excluding the protest responses. The exclusion of these responses might be expected to lead to selection bias, thereby invalidating the results. However, by employing a bivariate probit selection model for estimation, it has been demonstrated that the decisions to protest and not form part of the market are not correlated: so, the exclusion of the protest responses is not problematic.

In order to contextualize the proposed payment, this can be compared with the average value of the proposed method of payment, the IBI. **Table 5** shows the tax demands issued by the municipalities and the hypothetical increase in these demands in each case. The increase to the IBI is different for each municipality because the tax rate is set by the individual local authorities. Thus, Caudete de las Fuentes has the lowest tax rate (0.40%) and would be subject to the highest relative increase; in contrast, Valencia has the highest tax rate (0.97%) and would therefore see the lowest increase in relative terms.

The mean estimated WTP (€46.72) can be multiplied by the number of homes (which is equal to the number of IBI tax demands issued, 671,076) in the area of influence of the CRRV restoration project, resulting in an annual social benefit of €31.35 million. In order to obtain the current value, a social discount rate and a time limit must be chosen. These two variables are not free from controversy in the aggregation process, as the estimated social benefit depends specifically on the values used. Newel and William (2003) [41] propose, for environmental valuations, that the rate should be reduced from 4% al 2% after 100 years and they advise using 1% if

the time period considered exceeds 200 years. For our case, rates of between 1% and 6% were used, in order to be able to include the rate of 6%, which is the one which Spain's Ministry of Public Works (*Ministerio de Fomento*) uses as shown in **Table 6**. With regard to the time limit, 25 years was chosen as the useful life of the CRRV restoration project. The results obtained show the expected value of the overall social benefits of the CRRV restoration project for social discount rates between 1% and 6%. The value obtained for the CRRV therefore ranges between €400.79 million for a social discount rate of 6% and €690.48 million for a rate of 1%.

6. Conclusions

This estimation of the social benefits of a project to restore a former drovers' road, the *Cañada Real del Reino de Valencia*, for recreational purposes, provides information which can improve the efficiency of resource allocation for public spending on improving recreational and environmental services and the demand which has increased in recent years.

Assuming a useful life of 25 years for this CRRV restoration project, the minimum estimated value of the benefits associated with recreational use is 441.82 million euros for a social discount rate of 5%. The benefits of undertaking the restoration project may be felt outside the boundaries set in this study, as people from outside the study area in Valencia can come to enjoy the landscape of any of the municipalities through which the CRRV passes.

In addition, by assisting in revitalizing some rural areas which have been in decline in recent decades, these municipalities may experience an increase in economic activity due to the effect of tourism associated with the new use of the drovers' road. This positive impact on the development of a rural and mountainous area has not been considered in this study, although it may be of interest to do so in the future.

We have also found that the variables regarding individuals' interest in and concern for the environment, in general, and drovers' roads, in particular, have an influence on the perception of the environmental benefits of the proposed improvement. This demonstrates the fact that there is a need for the implementation of an environmental restoration project of this kind to be accompanied by campaigns to raise public awareness and encourage public participation: both to legitimise the process and also to be able to estimate the environmental effects of the abandonment and encroachment on drovers' roads more precisely.

Having achieved the valuation objectives of this study, we are aware of the questions that may be raised concerning the WTP estimations and the method employed. The contingent valuation method has limitations, since

Table 5. Hypothetical increase in the IBI property tax.

	Number of tax demands	Tax rate	Current mean payment	Hypothetical proposed payment	Percentage increase
Fuenterrobles	675	0.60%	91.97 €	138.69 €	50.80%
Camporrobles	1447	0.65%	93.16 €	139.88 €	50.15%
Caudete Fuentes	966	0.40%	62.13 €	108.85 €	75.20%
Utiel	10,910	0.76%	157.58 €	204.30 €	29.65%
Requena	18,024	0.52%	86.00 €	132.72 €	54.33%
Siete Aguas	2684	0.86%	95.11 €	141.83 €	49.12%
Buñol	7387	0.79%	198.71 €	245.43 €	23.51%
Valencia	628,983	0.97%	273.94 €	320.66 €	17.05%

Source: compiled by authors using INE information.

Table 6. Expected social benefits (millions of €).

	1%	2%	3%	4%	5%	6%
Total CRRV	690.48	612.11	545.95	489.79	441.82	400.79

Source: compiled by the authors.

the interviewees must correctly interpret the valuation scenario presented and give sincere answers to the questions. Although the recommendations found in the academic literature and those made by the NOAA have been followed, the drawbacks related to the proposed method of payment (a surcharge to the IBI property tax) or the processing of the zero responses received cannot be eliminated. A rigorous approach to these issues, which draws on recent contributions in this field and approaches the processing of these data from a different perspective, could lead to a modification to these results.

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