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WILLINGNESS TO PAY FOR WETLAND PRESERVATION: A CASE STUDY FOR LAKE VOLVI

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ABSTRACT

Water is rapidly becoming a scarce resource, mainly due to its established public nature and to our lack of ability to incorporate non-use values of water, as well as environmental concerns into the decision making process, thus largely underestimating its total economic value. The present paper addresses the issue of the economic value of the protected by international treaties (RAMSAR, NATURA) wetland around Lake Volvi, using the Contingent Valuation Method. To this end, a suitably developed questionnaire was distributed to citizens of the municipalities surrounding Lake Volvi. This investigation can assist a proper design of an environmental protection policy that would additionally have the citizens' full support.

1. INTRODUCTION

Water quality and quantity are nowadays considered among the most important issues in global environmental protection, due to the simple fact that no water means no life. Until recent times water was taken as an eternal gift of mother-nature; therefore there was no need to worry for its preservation. Yet, today scientists warn humanity that, unless we revise our attitudes towards water use, we will face severe scarcity problems and a high probability of water conflicts or even wars in the very near future.

In full view of these high risks, the international community is starting to take action. About 100 countries have signed the RAMSAR Convention on Wetlands of International Importance. Wetlands receive special attention, because of their complex nature and unique local conditions, which allow for great biodiversity in these areas. According to the RAMSAR Convention, wetlands are defined as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters" and function as "the kidneys of the landscape" or as "biological supermarkets" [1]. Even when seen from an entirely anthropocentric viewpoint, functions such as flood control, support of the food chain, regulation of the local climate and enrichment of underground water reserves make wetlands vital to both human existence and economic prosperity. Thereafter, one would expect that their value would be obvious and self-evident. However, wetlands are often overexploited and ultimately loose their value. At

other times they are either considered a waste of fertile land or a health hazard and are thoughtlessly drained, thus creating a significant social cost [2].

The European Union, for its own sake recognizes the value of wetlands in the Water Framework Directive (WFD 2000/60/EC, art. 1). Article 1 of the WFD states that wetlands should be protected and their quality should be improved. This Directive also introduces the economic evaluation as a basic step of water management formulation [3].

The present paper aims to estimate, in monetary units, the indirect-use value and the non-use value of the Volvi wetland for the people that live and work within its boundaries, using the Contingent Valuation Method (CVM). The wetland of Lake Volvi is part of the Koronia – Volvi wetland, which is of international importance and is protected by international treaties, such as RAMSAR and NATURA 2000. Assessments of this sort are essential when formulating sustainable management plans, so that the true value of nature is not somehow underestimated. The study of the particular area presents an additional interest: the fact that Lake Koronia, which is close to Lake Volvi (in fact the two lakes used to be one in the past), is already drying-out, over-polluted and practically a 'dead' lake, with very slim chances of recovery. It would, therefore, be very intriguing to find out how people that are already familiar with the results of overexploitation value the existence of their own lake.

2. METHODOLOGY

2.1 Contingent Valuation Method

Any economic valuation study has to reflect the total economic value of the proposed activity. This means that all costs and all benefits have to be fully determined. Costs and benefits, apart from direct use values, include non-market use values as well as non-use values [4]. These values are very difficult to identify, since there are no actual markets where goods, such as natural beauty or a 'living' tree, could be either bought or sold [5]. The contingent valuation method is the most common stated preference technique used to evaluate both use and non-use values. In most of the times it is the only way to elicit people's willingness to pay, by asking them directly to state a specific amount using hypothetical markets [6]. The fact that the evaluation is based on hypothetical questions is the basic criticism of CVM. However, since there is no other effective method to replace CVM, if carefully designed, it remains our only way to incorporate environmental concerns into the decision making process.

The basic tools of CVM are questionnaires in which a hypothetical scenario is presented to the survey participants. According to Carson [7], in order for the questionnaire to effectively measure what it is designed to measure it has to include the following: a) an introductory section that helps set the general context for the design to be made, b) a detailed description of the good to be offered to the respondent, c) the institutional setting in which the good will be provided, d) the manner in which the good will be paid for, e) a method by which the survey elicits the respondent's preferences with respect to the good, f) debriefing questions about why respondents answered certain questions the way that they did, and g) a set of questions regarding respondent characteristics including attitudes and demographic information.

Conforming as much as possible to the above, the survey questionnaire, which has been developed for the needs of the present investigation, comprised of four sections: a) questions regarding the participants' knowledge of the state of the wetland, b) questions regarding the personal values and beliefs of the participants, both in relation to the wetland, as well as to a more general list of values,

such as personal relationships and global problems [8], c) the contingent valuation scenario and valuation questions, and d) demographics.

In the contingent valuation part of the questionnaire, participants were first asked whether they would at all be willing to pay an amount of money to help maintain or even improve the state of the wetland of Lake Volvi. Payment supposed to be made through the bi-monthly electricity bills. This payment vehicle was chosen because electricity bills are already being used to collect money for other public-service purposes (e.g. municipality rates), and, as they are familiar with it, local people would, up to a point, trust it. In this manner payment vehicle bias was avoided [9]. After establishing willingness to pay, a set of dichotomous choice questions and two open-ended questions (regarding the maximum and minimum amount of money) were asked in order to determine the amount that each respondent was willing to pay. In case a respondent refused to pay any amount, a follow up question was asked in order to identify whether this was a legitimate 'no' (for example because the respondent has no money) or a 'protest bid'. A protest bud means that the respondent is opposed to the scenario altogether, in which case it should be handled very carefully in the analysis stage of the survey [10].

2.2 Model selection

In order to be able to calculate the correct willingness to pay (WTP), we use the data from the questionnaire to identify the mathematical model that best fitted this set of data. That is, we have to formulate a function, which describes the relationship between a person's WTP (dependent variable) and a number of socio-economic characteristics (independent variables) that influence this choice. We then are able to predict any WTP, provided that we know the values of the independent variables. A typical regression model for handling this problem is of the form:

$$g(x) = B_0 + B_1 x_1 + B_2 x_2 + ... + B_p x_p \quad (1)$$

In our case, given the fact that our dependent variable (WTP) has a dichotomous format (yes/no), a binary logistic regression model should be used ([10], [11]) that reads

$$\pi(x) = \frac{e^{g(x)}}{1 + e^{g(x)}} \quad (2)$$

where $\pi(\boldsymbol{x})$ is the expected value of the outcome variable, given a set of p explanatory variables $\boldsymbol{x}$. As $p>1$ equation 2 describes a multiple logistic regression model, with a logit transformation of:

$$g(x) = \ln\left[\frac{\pi(x)}{1-\pi(x)}\right] = B_0 + B_1 x_1 + B_2 x_2 + ... + B_p x_p \quad (3)$$

which is basically the logarithm of the likelihood of the dependent variable occurring or not. In this way a normal distribution is acquired, which will make analysis and evaluation easier. In order to fit this model to our data, we have to determine the B_0 (constant) and the B_1,.., B_p coefficients, as these are basically the unknown parameters.

3. CASE STUDY APPLICATION

3.1 Description of the area

Lake Volvi, the second largest lake of Greece, is situated in the northern part of Greece, 40 km from Thessaloniki. It is, as stated above, part of the Koronia – Volvi wetland. The wetland also includes

the Apollonia Forest, the aesthetic forest of Rentina, and two plane trees, which have been declared monuments of nature. It covers an area of about 65 km^2 and reaches almost 20 m depth. Because of its tectonic origin, the north and south sides of it are quite different. The north part is rather rocky, whereas the south side is flat and more developed, with many farms operating across it. The lake is surrounded by five Municipalities (namely Apolonia, Egnatia, Sohos, Rentina and Madytos) and is widely known in Greece mostly because of its seismic activity, which generates large-scale earthquakes.

Agriculture is the main activity of the local population, especially at the areas directly surrounding Lake Volvi, because of the fertile land and the proximity to water. Farmers use large quantities of fertilizers, which exceed the amount per hectare used in other areas of Greece. This is mainly due to the type of crops, which require fertilizers, and to EU policy, which supported and subsidized these types of crops in recent years.

Tourism is also an important activity for a small part of the population, especially in the south part of the wetland, while fishing, an important source of income up until a few years ago, represents nowadays only a small percent of the family's income. Industrial activity is very low in this area, and it can be said that it does not present any significant threat to the environment, yet. Illegal hunting and urban sewage also play a small part to the deterioration of environmental quality. However, the water quality is still relatively good and there is, still, room for improvement. In the past, the two lakes, Volvi and Koronia, used to be connected through a natural trench, and water from Koronia was transferred to Volvi. However, the fact that Koronia's water level dropped significantly disrupted this connection, and practically protected Volvi from excessive pollution.

3.2 Survey design

The survey questionnaire was designed according to the CVM theory mentioned at section 2 of the present paper. After designing the first draft of the questionnaire, a pilot survey was conducted, in order to fully adapt the questionnaire at the conditions of the study area and to establish which the most effective bids were. For this purpose, 25 personal interviews were conducted with the mayors of the municipalities that surround the Lake, people working in public organizations and administration (such as the Region of Central Macedonia, the Prefecture of Thessaloniki and the Langadas County), and NGOs. Apart from defining the lower and upper boundaries of the bids of the evaluation scenario, the participants' comments were also recorded and adjustments were made accordingly.

The main survey took place at the beginning of 2007. 300 door-to-door interviews were conducted by trained interviewers, so as to avoid the interviewer bias. The total number of questionnaires was distributed according to the population of each municipality. This sample size is satisfactory, considering the total population of the area. Out of the 300 questionnaires, 296 were actually useable. The four that were left out of the analysis recorded bids that were either too low or extremely high.

The mean age of the participants is around 52 years, which is very typical for the Greek countryside, where young people leave their homes to look for better life conditions in large urban centers. Most of the participants have spent all their lives in this very area. The number of family members (3-4) is also close to the country's average family size. Most of the participants were either farmers or housewives, while there is also a large number of participants that are either freelance professionals or run their own business. 40% of the participants stopped their education when they completed the compulsory 9 years. A large number dropped out of school before completing primary education, while very few continued on to higher education. The family income

is mostly 500 – 1,000 € per month, possibly due to the fact that most of the population consists of farmers. It should be noted that there are very few people that earn more than 2,000 € per month. Finally, pleasure gained from the existence of the wetland is what is valued most among the participants.

Out of the 38 questions of the survey, a set of explanatory values was formulated for the purposes of the logistic regression analysis. The three non-categorical variables that proved significant for the logistic regression model are presented in Table 1, with their respective mean, median and standard deviation statistics. Of the 300 people interviewed about 70% accepted the payment scenario and stated that they are willing to participate. The most common reasons for refusing to participate were: a) "I cannot afford it", b) "I am already paying enough", and c) "I consider this the State's responsibility" (participants had the option to choose two reasons for saying 'no'). More than half of those refusing to participate mentioned at least one of these three reasons. Another important reason for not wanting to pay was that people were not confident that the money collected would actually be used for the purpose it is collected for (17%), which, however, had nothing to do with the payment vehicle. This type of an attitude is mostly related to Greek mentality.

TABLE 1. Regression variables and descriptive statistics

Variable name	**Description**	**Mean**	**Median**	**St. Dev.**
WTP	Willingness to pay (0=no, 1=yes)	0.48	0.00	0.501
BID	Bid	51.73	52.00	17.411
EDUC	Level of education	8.93	9.00	2.957

The model also includes the variables INCOME (the participant's family monthly income) and MUNIC (area of residence), which are not included in Table 1 because they were assigned categorical values and, therefore cannot be described by statistics like mean, median and standard deviation.

3.3 Results

For the purposes of the analysis, we analyzed only the responses of those who accepted the payment scenario, i.e. 209 participants. People that did not accept the payment scenario, but in the follow up question stated that the reason for not accepting it was that they did not have enough money, were also included in this group. The reason for doing this was that they did not actually object the principle of the scenario and would probably have accepted it if their income were higher.

The logistic regression analysis was conducted using the SPSS 14 software. Table 2 presents the variables of the best-fit model, in which WTP is the dependent variable, and provides information about the importance of each independent variable. The corresponding B_p coefficients of these variables are shown in the second column of Table 2. As presented in the sixth column, the significance level of all independent variables is below 0.05 with just one exception (i.e. variable MUNIC with a significance level less than 0.10).

Finally, Table 3 presents a list of performance parameters of the model, that is, parameters that assist in evaluating the goodness of fit of this particular model. For example, the overall percentage shows at what percentage the model would have correctly predicted the WTP of our data. Indeed, the calculated 75% for the chosen model is a very satisfying percentage.

TABLE 2. Model coefficient estimation

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
BID	0.436	0.074	34.521	1	0.000	0.647
EDUC	0.139	0.068	4.247	1	0.039	1.149
INCOME	0.544	0.272	3.990	1	0.046	1.723
MUNIC	-	-	7.988	4	0.092	-
MUNIC(1)	0.325	0.603	0.291	1	0.590	0.722
MUNIC(2)	0.551	0.587	0.881	1	0.348	1.736
MUNIC(3)	0.811	0.560	2.096	1	0.148	2.250
MUNIC(4)	0.491	0.516	0.904	1	0.342	0.612
Constant	1.172	0.759	2.385	1	0.123	0.310

TABLE 3. Estimation of performance parameters

Performance parameters	Values
x^2	77.316
-2 Log Likelihood	195.373
Cox & Snell Square	0.325
Nagelkerke R Square	0.433
Overall percentage	75.6
N	209

4. CONCLUSIONS

The best-fit model indicates that WTP depends first and foremost on the amount presented to the participant (bid), but also on his/her education, the income and the proximity of his/her home municipality to the lake. These results agree with economic theory, in that social, demographic, economic characteristics and social values influence people's decision to pay or not and if 'yes', the amount they are willing to pay [12]. For example, it is quite a logical outcome the fact that WTP decreases as the BID amount rises.

The most important conclusion of the survey is that it establishes that people are actually willing to pay an amount, however small, to help any management scheme. Local people, despite our original fears, welcomed the survey and were more than willing to participate in the study. They were aware of the main issues and quite concerned about them, mainly due to the major problems the neighboring Lake Koronia faces, and they would not wish to see Lake Volvi face the same problems in the near future.

The area is designated as an important wetland, according to NATURA 2000 and RAMSAR convention. Drastic measures are therefore required. Greece has to start fulfilling its obligations regarding the protection and preservation of the area. Any actions taken so far appear not to be effective, as the state of the environment of the wetland has deteriorated in the past years and some of the damage cannot be reversed. The results of this paper can provide a starting point for the calculation of the total economic value of the wetland, which in turn will make any cost-benefit analysis (CBA) that concerns the area much more accurate and effective. An accurate CBA, which incorporates social costs and environmental concerns as well, is the foundation of the formulation of sustainable management plans. However, such studies are still scarce in Greece, and are a subject for further consideration.

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