Economic valuation of coastal zone quality improvements

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Abstract
Individuals' decision to use a particular coastal beach is influenced by their preferences and perceptions as well as beach's characteristics. This study examines visitors' attributes and desired site specific characteristics in order to determine the factors affecting willingness to pay for an improvement quality (environment, water as well as recreation activities) program. A contingent valuation survey is carried out in order to evaluate the economic benefits of improving coastal quality of beaches in a coastal line of an area in Central Greece (Volos) where persistent failures to meet the standards of the Blue Flag program are observed. Our empirical findings suggest that the major variables affecting respondents' willingness to pay were related to income, age, gender, coastal recreational activities and environmental quality of the site as well as to previous environmental behavior and mainly if they had paid for environmental protection in the past.

Keywords: Coastal zone; contingent valuation; economic value of recreation; blue flags.

JEL Classification codes: Q50; Q51.

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1. Introduction

Coastal zones are unique ecosystems different from the oceanic or terrestrial and they are attractive and important areas for socio-economic development that supports life on our planet and affects the present and future well being of human societies. They also deliver a series of goods and services that are of benefit to humans, including opportunities for recreation. People do not only use the coast like aquaculture but also enjoy it like coastal recreation and coastal zones are traditional hotspots for tourism and leisure activities (Jennings, 2004).

Coastlines worldwide receive millions of visits every year for recreational activities such as swimming, surfing, wildlife viewing, beach-going etc. Sometimes the demand for coastal recreation can outstrip the capacity of the area and the impacts of recreation on natural conservation can create short (or long) term damage (Goodhead and Jonson, 1996). Recreation is an important component of social well-being (Driver et al., 1991). Coastal tourism and recreation have rabidly increased over the past decades becoming a primary contributor to the Gross Domestic Product (GDP) of several countries attracting tourists who spend money in the local economy.

Forty percent of the world population lives within 100 km of the coast, thus representing a pressure on coastal resources (Carter, 2002). Increased population growth and the shift of population to the coastline have created an increasing pressure on coastal assets all over the world. People's decision for costal recreation is affected by environmental status of coastal zone. The demand for recreation activities is influenced by site characteristics and individuals' preferences (Parsons et al., 2000; Roca et al., 2009).

According to Paudel et al. (2011) sites' environmental characteristics are important factors in the decision-making process of campers and swimmers for

choosing a recreation site. At the same time these characteristics may be more important than availability for swimming as an activity of a recreational trip. In this way a change of the environmental status of the sea resulting in a changed provision of recreation services will therefore affect wellbeing and profits. Moreover apart from the natural features recreational services offer, they also influence beach users' demands and they are a significant reason for choosing a particular beach (Roca et al., 2009). Thus if we want to increase the benefits (recreation value) of a coast we must improve the quality of environmental status and recreation services.

Recently the attention within the European Union has been focussing on the costs and benefits of improving coastal water quality mainly because of the high cost of failure for many waters to reach the quality standards (Langford et al., 2000). In this paper, we carry out a contingent valuation survey in order to estimate the economic benefits of improvements to coastal quality of beaches in Volos (located in Central Greece) coastal line where persistent failures to meet the standards of the Blue Flag program are observed. The Blue Flag is an award for coastal destinations which have achieved the highest quality in water, facilities, safety, environmental behavior (environmental education) and management which are the main criteria of the program.

Specifically, the objective is to identify the socio-demographic determinants that affect beach users' perceptions in order to generate relevant information for coastal managers. Beach recreation is an important contributor to welfare in Volos for both local and tourist populations. There are now a great number of visits to the beaches of Volos every year. This increase in recreation demand for Volos' coastal zone is accompanied with environmental quality degradation from land and industrial based activities, which exacerbates the existing coastal environment degradation problems.

For this reason we explore beach users' perceptions and attitudes towards beach quality.

The structure of the paper is as follows. Section 2 presents the background to the problem as well as the existing relative research efforts. Sections 3 and 4 discuss the survey methods adopted and the proposed econometric methods respectively. Section 5 presents the empirical results derived while the last section concludes the paper.

2. Background

Alterations in environmental processes and functions can result in a number of actual and perceived social welfare changes (Atkins and Burdon, 2006). Once a beach has changed the activities of a resource-based recreation this may change also the benefit values to visitors. The concept of environmental value is directly related with any net change in society's wellbeing and is based on people willingness to pay for goods or services (Johnson and Johnson, 1990). So the value the society places on the coastal resources is a function of the different uses and services the coastal resources provide.

The primary goal of nearly all public and recreational land management agencies is to maximize visitors' satisfaction (Ditton et al., 1981). At the same time, policy makers recognize the potential benefits associated with improved coastal access and amenities and rational public decision-making on financing improvements to coastal recreational amenities requires that these economic benefits should be clearly identified and valued.

Decisions regarding the future management of coastal resources must be focused on changes in the various service flows that emanate from them under alternative management strategies. The values held by society for the alternative

outcomes – including environmental service flows such as recreational opportunities- are crucial in understanding which alternative will yield society the greatest net benefit. Economic valuation studies are an important tool for making more informed decisions about the use, providing information which policy makers and managers require to deal with the coastal environment.

Several studies have estimated the recreational economic benefits of quality improvements in coastal zone including water, services and site quality improvement. According to Beharry-Borg et al. (2009) there are two main study categories on the economic valuation of coastal recreation. The first refers to studies related to recreational value of beach access due to a change in site quality characteristics which are unrelated to water quality (Silberman and Klock 1988; Parsons et al., 2000; Hanley et al., 2003; Landry et al., 2003). Similarly, the second category focuses on the economic valuation of recreational beach access due to changes in a site characteristic linked to water quality (Vaughn et al., 1985; Bockstael et al., 1987).

Numerous methods exist for economic estimation of non-market benefits including recreation benefits. The most popular methods are travel cost, random utility and the contingent valuation (hereafter CVM). The latter is one of the most popular method especially because of advances in the theory (Stevens, 1997), and its cost advantage compared to other methods (Diamond and Hausman, 1993).

Since 1980s, economists widely used CVM to determine people's willingness to pay for natural environment protection. According to a number of these studies, people's satisfaction from outdoor recreational activities is strongly related to their preferences and specific attributes of the resource in question (Mill et al., 2007). A number of other studies, using CVM, value the recreation benefits of coastal zone and explore how beach attributes influence positively people's WTP.

There are also a significant number of qualitative and quantitative studies that report on public attitudes and preferences to features of the coastline beaches (Barry et al., 2011). People preferences, needs and perceptions for environmental quality should be added to any evaluation process (Priskin, 2003). However the determinants of people's willingness to pay for coastal beach protection programs have not been defined and explored (Lindsay et al., 2008). A number of researchers claim that among others, influential factors for the WTP are income, previous experience with a resource and knowledge of preservation issues (Kotchen and Reiling, 2000; Giraud, et al., 2002).

In Greece, to our knowledge, there is not any research devoted to coastal recreational values with previous studies measuring benefits associated with nutrient cycling and potential operation of a wastewater treatment plant. Jones et al. (2008) using a CV survey evaluated environmental benefits resulting from the construction of a Sewage Treatment Plant (STP) in Mitilini (the capital of Lesvos Island in Greece). The main benefits identified were the improvement of the coastal water quality and subsequent impacts on citizens' activities. Estimated results indicate that residents of the city of Mitilini were willing to pay 17 € every four months over a period of four years. Moreover due to the significant amount of zero and protest responses, different measurements of mean WTP were calculated and the need for further research on social factors which influence individuals' valuation was emphasized. Organtzi et al. (2009) investigated the environmental benefits expected to result from the construction of a wastewater treatment plant in a seaside village located at the coast of Toroneos Gulf.

3. Survey Methods

A contingent valuation survey was carried out to 300 randomly selected residents of Volos city, who were using beaches along the Pagasitikos Gulf. Volos is a coastal port city in Thessaly situated in the middle of the Greek mainland and is built along the Pagasitikos Gulf. It is the only outlet towards the sea for the prefecture of Thessaly and it is dedicated mainly to sun-and-sea tourism. The 56 km long coast of Volos offers beautiful beaches safe for swimming with high quality of waters. At present, the Municipality of Volos has nine beaches awarded with blue flags and occupies a high position among Greek mainland cities with "Blue Flag" international awards. On the other hand, Volos' port is the third of Greece's major commercial ports. As a consequence, this may result to heavy human activities on coast and pollution unplanned infrastructures, which sometimes cause major environmental problems to the coastal zones. A multiplicity of human uses and benefits are derived from the Volos' coastal zone and is important to be valued.

Face-to-face interviews were conducted on-site on beaches, with varying degrees of water quality. Respondents were asked to evaluate the morbidity effects of the benefits of actions to improve water quality and restore Blue Flag status. For this reason a survey instrument was developed and tested according to guidelines established by the NOAA panel (Arrow et al., 1993). 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 determine the range of different WTP amounts.

The questionnaire comprised 27 items divided into three sections delivered to respondents in the following order. The **introductory part** introduced the respondents to the purpose of the study presenting all the necessary background

information about the aim of the survey. At the same time it assured the respondents that their answers would be dealt with confidentiality. Next, s**ection 1** is a general information section where respondents were asked to provide information on their household like socio-economic status, sex, age, educational level, income level, number of dependents etc. In this section of the survey respondents were also asked to give information about general ecological attributes towards the environment.

Before we move to section 2, it is worth mentioning that previous studies have shown that users' beach decision is unduly influenced by beach awards signals, such as the Blue Flag award, for this reason, these awards are widely used to determine the recreational use value of beaches (Nahman and Rigby, 2008). As already mentioned, the WTP section was constructed according to guidelines established by the NOAA panel (Arrow et al., 1993).

Following these lines, in **section 2** the background information about blue flags programs was provided together with information on a hypothetical plan for receiving Blue Flag accreditation to five new beaches to elicit values through willingness-to-pay (hereafter WTP) questions. The question format was a voter referendum to approve this effort. Respondents were asked, prior to the WTP question, whether they would be in favor of supporting such a program. Implementation of the program would cost them a specified amount of money (in €) in a one-time payment. In the second phase, the WTP was elicited only from people who had answered positively to the first question, this time by asking if they are willing to pay a specific amount of money to confirm their participation. Specified amounts were randomly assigned to respondents. Bit step amounts were used based on the results obtained in the pre-test and in the pilot study where an open-ended

question ranged from 5 € to 50 € (bit step 5 €). Follow-up questions were asked to determine reasons for respondents' answers.

In s**ection 3** respondents were asked to indicate the importance of different reasons for saying yes to the proposed scenario and to express their WTP. Blue Flag status indicates that the beach has complied with water quality, environmental education and information, environmental management and safety criteria (The Blue Flag, 2007). The Blue Flag means that a number of requirements regarding the quality of water, environment and services are fulfilled, which are related with use and non use benefits. Respondents were asked to indicate on a five-point Likert scale their opinion about 22 benefits associated with the blue flag award.

4. The proposed econometric models

Having collected data on the amount that respondents were willing to pay as well as a number of explanatory variables, the first model formulation was an OLS. Together with the amount that the respondents were willing to pay we collected information in the form of a binary variable (1=Yes and 0=No) in their participation in protecting the environment and expressing their WTP. This binary variable together with the explanatory variables were next used in a logistic regression model formulation.

In this formulation, Y_i is the dichotomous variable taking the value of 1 with probability Θ and the value of 0 with probability $1-\Theta$.[3] This random variable has a discrete probability distribution of the form

$$\Pr(Y_i, \Theta_i) = \Theta_i^{Y_i} (1-\Theta)^{1-Y_i} \quad (1)$$

[3] For more details on the properties and applications of logistic regression see Halkos (2011), Kleinbaum (1994), Hosmer and Lemeshow (1989), Collett (1991), Kleinbaum *et al.* (1999), Hair *et al.* (1998), Sharma (1996).

The product of the marginal distributions for the Y_i 's given the mutually independent $Y_1, Y_2, \ldots, Y_n$ has the likelihood function of (1) as

$$L(Y;\Theta)=\prod_{i=1}^{n} \Pr(Y_i;\Theta_i) = \prod_{i=1}^{n}\left(\Theta_i^{Y_i}\left(1-\Theta_i\right)^{1-Y_i}\right) \qquad (2)$$

where $\Theta=(\Theta_1, \Theta_2, \ldots, \Theta_n)$.

In our collected data the first n_1 out of n observations express WTP and so $Y_1=Y_2=\ldots=Y_{n1}=1$ while the rest of the observations do not and so $Y_{n1+1}=Y_{n1+2}=\ldots=Y_n=0$. This implies that expression (2) becomes

$$L(Y;\Theta)=\left(\prod_{i=1}^{n1}\Theta_i\right)\left[\prod_{i=n1+1}^{n}(1-\Theta_1)\right] \qquad (3)$$

The logistic model assumes that between Θ_i and X_{ij}'s a specific form exists given by

$$\Theta_i = \frac{1}{1+e^{\left[-\left(\beta_0+\sum_{j=1}^{k}\beta_j X_{ij}\right)\right]}} \qquad i=1,2, \ldots, n \qquad (4)$$

Replacing Θ_i in (3) we derive the likelihood function as[4]

$$L(Y;\beta) = \frac{\prod_{i=1}^{n1} e^{\left(\beta_0+\sum_{j=1}^{k} X_{ij}\right)}}{\prod_{i=1}^{n}\left[1+e^{\left(\beta_0+\sum_{j=1}^{k}\beta_j X_{ij}\right)}\right]} \qquad (5)$$

The regression slopes of the logistic model quantify the relationship of the independent variables to the dependent variable involving the parameter called the Odds Ratio (OR). OR is defined as the ratio of the probability that WTP will take place divided by the probability that WTP will not take place. That is

$$\text{Odds}\,(E \mid X_1, X_2, \ldots, X_n) = \frac{\Pr(E)}{1-\Pr(E)} \qquad (6)$$

[4] Although we assume an unconditional maximum likelihood function that could lead to biased estimates of β's as our data size is large this potential problem is not so serious.

The logit form of the model is a transformation of the probability Pr(Y=1) that is defined as the natural log of the odds of the event E(Y=1). That is

$$\text{logit } [\Pr(Y=1)]=\log_e[\text{odds } (Y=1)]=\log_e \left[\frac{\Pr(Y=1)}{1-\Pr(Y=1)} \right] \quad (7)$$

5. Empirical Results

5.1. Respondents' profile and reliability analysis

As already mentioned, respondents were asked on their stand against blue flags. The majority of them (71%) showed knowledge about the blue flag program and were concerned about the existence (84%) of a blue flag award. However, only 65% of the respondents preferred beaches with blue flag award. Table 1 presents the descriptive statistics of respondents' basic socioeconomic characteristics.

Table 1: Descriptive statistics of respondents' basic socioeconomic characteristics

	Observations	Mean	Standard Deviation
Gender (%)	300	Male (56.5%)	
Age (years)	298	28,62	11.0032
Education level (years)	300	13.54	2.65
Mean Monthly income (€)	300	967.71	563.25
Past Payment	300	0.09	0.287
WTP Amount (€)	288	27.5	14.4
Dichotomous WTP	299	0.4013	0.491
Family members	300	3.0533	1.602

Environmental concerns have rapidly grown and many times focus on environmental attitudes that affect people's ecological behavior. For these reasons we try to have more information about respondents' awareness and knowledge of environmental problems. Only 39.2% of the participants in this research took part in the past into volunteering activities for environmental protection, mainly by their participation in local recycling actions (65.1%) or by using recycled items (28.6%) or cleaning coastal zones (13%).

All respondents were asked to rate their level of agreement with a series of statements about causes of water resources degradation and then to choose the most important of them. According to the results in Table 2, the most popular reasons of water resources quality degradation were the wastes produced from various agricultural establishments. Agricultural wastes include both natural (organic) and non-natural wastes.

Table 2: Causes of water resources degradation
(Number of respondents and %)

Microbial pollution	160 (53.2%)
Toxic substances	179 (59.2%)
Eutrophication	77 (25.6%)
Oil slicks	178 (59.1%)
Inert waste	80 (26.6%)
Landslides and	191 (63.5%)
Urban wastewater	88 (29.2%)
Stock-farming wastes	179 (59.5%)
Agricultural waste	209 (69.4%)
Industrial wastes	68 (22.6%)
Thermal pollution	63 (20.9%)
Nuclear waste	90 (29.9%)
Climate change	89 (29.6%)
Population growth	2 (0.7%)

Table 3 presents the responses to WTP question. The 6.33% were willing to pay at the lowest price of 5€, but as the price bid increases, the percentage of WTP decreases and at the highest price bid of 50€ only 2.33% were willing to pay. The low rate of affirmative bit amount in all respondent groups is in line with previous studies (Cummings and Taylor 1999; Giraud et al., 1999; Subade, 2005).

On the other hand, respondents who stated a positive WTP were asked to distribute this amount among the Blue Flag criteria for a beach awarding. Table 4 shows how the aggregate total WTP for all respondents was distributed between water quality for swimming, environmental education and information, environmental

management and safety and services. The total (100%) of responders WTP was given for water quality and environmental management; that is the only two criteria related with environmental quality improvement or protection.

Table 3: Respondents' WTP

	WTP Reply	
Bid Price	No	Yes
5.00	11 (3.67%)	19 (6.33%)
10.00	16 (5.33%)	14 (4.67%)
15.00	18 (6.00%)	12 (4.00%)
20.00	14 (4.67%)	16 (5.33%)
25.00	16 (5.33%)	14 (4.67%)
30.00	20 (6.67%)	10 (3.33%)
35.00	18 (6.00%)	12 (4.00%)
40.00	22 (7.33%)	8 (2.67%)
45.00	22 (7.33%)	8 (2.67%)
50.00	23 (7.67%)	7 (2.33%)
Total	179 (60.00%)	120 (40%)

Table 4: Total WTP to blue flag criteria (number of respondents and %)

	Water Quality	Environmental Education and Information	Safety and Services	Environmental Management
0%	2 (1.7 %)	3 (2.5%)	5 (4.2 %)	7 (5.8 %)
2%		1 (0.8%)		
5%	2 (1.7 %)	7 (5.8%)	9 (7.5%)	5 (4.2%)
8%			1 (0.8%)	
10%	11 (9.2%)	30 (25%)	30 (25%)	25 (20.8%)
15%	3 (2.5%)	5 (4.2%)	9 (7.5%)	4 (3.3 %)
20%	15 (12.5%)	24 (20%)	33 (27.5%)	28 (23.3%)
25%	9 (7.5%)	14(11.7%)	10 (8.3 %)	14 (11.7%)
30%	17 (14.2%)	17 (14.2%)	15 (12.5%)	18 (15 %)
35%	1 (0.8%)	1 (0.8%)	1 (0.8%)	1 (0.8 %)
40%	20 (16.7%)	7 (5.8%)	1 (0.8%)	12 (10%)
45%		1 (0.8%)		
50%	21 (17.5%)	7 (5.8%)	5 (4.2%)	2 (1.7%)
60%	10 (8.3%)	2 (1.7%)		
65%	1 (0.8 %)			1 (0.8%)
70%	4 (3.3%)	1 (0.8%)	1 (0.8%)	2 (1.7%)
80%	2 (1.7%)			
100%	2 (1.7%)			1 (0.8%)

In this study the Principal Components Analysis (PCA) was used as a tool for measuring different public perceptions needs and preferences with regard to

improvement of coastal zone quality. It is valuable to coastal managers and can be effectively used to plan environmental management and develop sustainable tourism if we know how users perceive beach quality. For that reason respondents were asked to indicate the importance of different reasons for saying yes to the CV scenario.

Specifically, for this reason respondents were asked to indicate on a five-point Likert scale (Not at all, Not Much, Fairly, Much, Very Much) for each topic (Babbie, 1989) their opinion for the importance of 22 reasons for saying yes to CV scenario. The 22 reasons were chosen according to the four criteria for awarding a beach with blue flag award. Reliability analysis of the question revealed that Cronbach-*a* was 0.87 (Table 5).[5] The PCA has extracted three factors explaining 57.8 % of the fluctuation of the total variance (Table 5)[6]. The Kaiser-Meyer-Olkin (KMO) criterion for sampling adequacy was equal to 0.789 and the Bartlett's test of sphericity was equal to 1031.42 (with a P-value of 0.000).

The results of PCA indicate that the respondents were able to clearly distinguish between the three criteria from the set of items provided. The first factor identified by the respondents was the most important, explaining 32.95 % of the total variation in the data and can be called «beach and environment protection». For responders saying yes to CV scenario this is the best way to ensure protection of coastal zone, water and environment quality. All items, except one, are related to the protection of coastal zone. Respondents were willing to pay mainly because they want to protect the quality of natural environment and the entire ecosystem. Taking into

[5] The reliability level of Cronbach-*a* that is nsidered to be satisfactory, depends on the stage of a research and the targets of the researcher. Usually indexes are considered to be satisfactory when they are higher than 0.6 (α>0.6) (Malhotra, 2008) or 0.7 (Nunnaly, 1978).

[6] Components with eigenvalues greater than 1 were considered and solutions with three and more components were examined. A three component solution was eventually used, as at this level the number of extracted factors is a function of the point where the total variance explained starts to level off (Addams, 2000).

Table 5: Rotated Component Matrix

	Components			
	Beach and environment protection	Facilities & Tourist development	Environmental management	Commu-nalities
Q(17) To protect the coastal beaches	0.80			0.32
Q (3) For continually monitoring the coastal zone quality	0.75			0.51
Q (16) For the possibility of adopting protecting measures on coastal zone (like fine)	0.75			0.63
Q (22) To protect the natural ecosystem on coastal zone	0.67			0.45
Q (11) To offer to society by protecting the natural environment	0.61			0.45
Q (10) For the beauty of the coastal zone	0.57			0.25
Q (4) To protect natural fish populations	0.52			0.55
Q (9) To construct information center about natural environment and recreation facilities	0.488			0.50
Q (18) To take part in a well environmental management program	0.46			0.37
Q (6) To develop local economy through the protection of natural fish populations	0.37			0.41
Q (15) To ensure safety precautions to be posted at the marina		0.72		0.45
Q (7) To develop marine recreation activities in the future		0.71		0.56
Q (13) To construct a camp in coastal zone		0.68		0.54
Q (12) To adopt safety measures in place to protect beach users (lifesavers patrol beaches)		0.66		0.53
Q (14) To adopt safety measures in place to protect beach users (first aid equipment)		0.63		0.60
Q (5) To adopt sustainable tourism programs		0.52		0.58
Q (1) To exist maps on the beach indicating different facilities		0.50		0.66
Q (2) To ensure requirements and standards for excellent bathing water quality			0.65	0.40
Q (8) To ensure requirements and standards for excellent quality of natural environment			0.64	0.44
Q (19) For the possibility of utilizing in the future some products unknown today			0.63	0.46
Q (20) To contribute in a sustainable management program for coastal zone			0.60	0.35
Q (21) To offer environmental education activities and developing research programs on coastal zone			0.43	0.50
Eigenvalues	6.15	2.46	1.91	
Cronbach's a	0.84	0.78	0.64	
Total Variance explained (%)	57.81			
Total Cronbach's a	0.87			
Kaiser-Meyer-Olkin Measure	0.79			
Bartlett's Test of Sphericity	$\chi^2 = 1031.42$ df = 231 Sig. = .000			

account the items of the first factor we can assume that it mainly refers to the existence value of the coastal zone. The classification existence value in the first place shows the importance of the coastal zone for their recreational uses.

The high percentage of variance of this factor shows that it plays the main role in users' decision to pay for the coastal zone. Existence value arises from the benefit an individual derives from knowing that a resource exists or will continue to exist, regardless of the fact that (s)he has never seen or used the resource, or intends to see or use it in the future. Ecosystems may be valued differently according to the type of value being activated, so there are two types of values, instrumental and intrinsic values.

According to O'Neill (1992) intrinsic value is used as a synonym for a non-instrumental value. Nature has both intrinsic and instrumental values. Vilkka (1997) claims that nature has an intrinsic value when it is valuable for itself and an instrumental when it is valuable to people and contributes to their well-being. On the other hand, Pearce and Turner (1990) point out that the existence value stems from different forms of altruism. According to Turner (1999) existence value is a special form of altruism. For some environmental economists existence values are not only derived from altruism but sometimes stem from the knowledge about resource existence related to the use by other people (Kolstad, 2000), and environmental responsibility (Bishop and Welsh, 1992). Randall (1986) points out that existence value has traditionally been associated with unique natural phenomena threatened with irreversible damage.

The second factor that was identified by the participants in the research was named "facilities and tourist development". All items of the second factor were related to the existence of a tourist development and emergency plan. Safety and

services is also one of the four criteria for awarding a coastal zone with the blue flag award and the second reason for the respondents saying yes to a CV scenario. Tourism development, first-aid and lifesaving equipment are related to the direct use value of coastal zone. Direct use values refer to the economic dimension of coastal resources and indicate people's WTP for benefits provided by them or the level of compensation they would expect for the loss of those benefits. The fact that the target group of this research was recreational users made their results more predictable because they have a more instrumental relation to the area and are quite familiar with its value so it is easy for them to identify the direct use value.

According to Pearce and Moran (1994), direct use value is derived from the direct personal use of the environment and is associated with benefits that are derived from fish, agriculture, fuel wood, recreation, transport, wildlife harvesting, peat/energy, vegetable oils, dyes, fruits, etc. This suggests that different ecosystems may be valued differently according to the type of value being activated. This is expected because this type of value holds to the environment by people who have consumptive or non-consumptive use of them like hunters, fishermen, climbers, recreational users etc (Prato, 1998). As environment's instrumental value is a measure of how it can offer benefits to humans, unlike intrinsic value, depends on its rarity or "naturalness" (O'Neill, 1992) and it is expected that respondents value high the recreational use of coastal zone.

The third factor was called "environmental management" and it was associated with the management of coastal zone to ensure a level of water and environment quality. We can say that all the items that load to third factor, except the last one, were components of indirect use value of the coastal zone. Functional value describes the indirect services of the coastal zone. Indirect-use values associated with

water resources include biological support, climate modulation, and global life support. Indirect use values, also known as functional values, can be described as the benefits indirectly enjoyed by people as a result of the primary ecological function of a given resource.

5.2 Econometric results

As our interest is in terms of the main effects we have ignored possible interactions. Working with the most statistically significant variables we ended up to the following OLS and logit model formulations:

OLS $WTP= \beta_0 + \beta_1$ Age $+\beta_2$ Years of Education $+\beta_3$ Income $+\beta_4$ Coast Protection $+ +\beta_5$ Coast Development $+ \beta_6$ Coast Management $+ \varepsilon_t$

LOGIT $[Pr(Y=1)] = \beta_0 + \beta_1$ Gender $+ \beta_2$ Years of Education $+ \beta_3$ Income $+ +\beta_4$ Past Payment $+\varepsilon_t$

where in the OLS formulation WTP represents the amount respondents are willing to pay; Y in the logit formulation denotes the dependent variable as 1 for expressing WTP and 0 for no WTP. The explanatory variables are Age representing the age of the respondents, Gender (taking the values 0, 1), years of education, income and past payment. The three factors extracted in the PCA are represented by the variables coast protection, coast development and coast management. The results of the fitted models are presented in Table 6.

Specifically, the results of the OLS model are presented in the first column. The signs of the variables are as expected and according to the economic theory. Note that the constant term and the variables income and Factor 2 (coast development) are significant in all the usual statistical levels (0.01, 0.05 or 0.1). The variables years of education, Factor 1 (coast protection) and Factor 3 (coast management) are statistically significant at the levels of 0.05 and 0.1 while the variable Age is

statistically significant at the 0.1 level. A number of diagnostic tests were performed testing first for normality (Jarque-Bera), next for heteroskedasticity (Breusch-Pagan-Godfrey, Glejser and White) and finally for specification error (RESET). In all cases there is no problem with this specific model formulation.

Next we move to the results of the logit model. Relying on the fitted model and the information provided we may compute the estimated odds ratio for WTP according to the variables used. The adjusted odds ratio in the case of past payment is 3.15 and in the education years 1.1. This implies that the odds of expressing WTP is about 3.15 and 1.1 times higher for an individual with past payment and an additional year of education respectively.

We may also compute the percentage change in the odds $\pi = \frac{\Pr(Y=1)}{\Pr(Y=0)}$ for every 1 unit in X_i holding all the other X's fixed. This means that in relation to the variable Past Payment the odds of expressing WTP increases by 15% ceteris paribus. Similarly, in the case of the variable Education Years the WTP increases by 11% for individuals with an additional year of education holding constant the rest of the variables. It is worth to comment that the percentage change in the odds for a monetary unit in income is tiny (0.0031%).

Concerning the individual statistical significance of the β estimates it can be seen that the constant term and the variables Gender and Income are significant in all the usual statistical levels (0.01, 0.05 or 0.1). The variable Past payment is statistically significant at the level of 0.05 and 0.1 while the variable Education Years is statistically significant at the 0.1 level. The overall significance of the model is given by X^2=43.76 with a significance level of P=0.000 and 4 degrees of freedom. Based on this value we can reject H_0 (where H_0: $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$) and conclude that at least one of the β coefficients is different from zero ($X^2_{0.05,4}$=9.488). The Hosmer and

Lemeshow value equals to 9.5624 (with significance equal to 0.2971). The non-significant X^2 value indicates a good model fit in the correspondence of the actual and predicted values of the dependent variable.

Table 6: Econometric results

	OLS	**Logit**	
		Estimates	Marginal effects
Constant	18.1971 (3.098) [0.0025]	-4.422 (-5.3964) [0.0000]	
Age	-0.4071 (1.769) [0.0799]		
Gender		0.9244 (3.1842) [0.0015]	2.5203
Education Years	0.1327 (2.52) [0.0120]	0.09778 (1.81) [0.0703]	1.1027
Income	0.00697 (2.849) [0.0053]	0.00309 (4.1164) [0.0000]	1.0031
Past Payment		1.14778 (2.3861) [0.0170]	3.1512
Factor 1 (Coast Protection)	2.3261 (1.984) [0.0499]		
Factor 2 (Coast Development)	3.2959 (2.6773) [0.0086]		
Factor 3 (Coast Management)	2.3577 (2.1521) [0.0337]		
Adjusted R^2 McFadden R^2	0.33	0.23	
Jarque-Bera	3.2071 [0.2012]		
Breusch-Pagan-Godfrey	0.7526 [0.6087]		
Glejser	0.89779 [0.4995]		
White	0.8652 [0.6558]		
RESET	0.2564 [0.7981]		
LR χ_4^2		43.76 [0.0000]	
Hosmer-Lemeshow		9.5624 [0.2971]	

t-statistics in parentheses and P-values in brackets.

6. Conclusion and policy implications

The objective of this paper was to investigate the motivations behind people's willingness to pay for coastal zone environmental and water quality improvements. Specifically, this study tried to explore the determinant factors affecting respondents' willingness to pay for coastal zone quality improvement and the award of a blue flag. Emphasis was paid to a system which takes account of differences in user preferences along coastal zone safety and environmental standards and recreation activities and tourism facilities.

In order to analyze the effect of the explanatory variables on WTP we have run different regression models. All variables included in the models to explain the WTP were also used in other similar surveys and they are justified by the economic theory. Specifically, all the variables included in the OLS model had anticipated signs. Income was expected to have a positive relation with WTP. According to Hanemann (1984) is not theoretically correct, the variable income to be included as control variable in the willingness to pay function in discrete response CV surveys.

On the other hand in many studies income was included in WTP function as elementary variable of people's behavior towards coastal zone quality (Bockstael, 1989; Whitmarsh et al., 1999). Generally, more income indicates that people would be willing to pay more. Schläpfer (2006), using a meta-analysis, explores the effect of income variable in a sample of 64 CV studies including 83 valuation scenarios and significant effects were found in only 30 valuation scenarios.

Age had a negative effect on WTP. Older people may not be able to contribute much due to several reasons like more expenditure on health, strong preference for alternative recreation activities or economic dependence after their retirements etc. The results of the survey are also in line with many other CV studies

(like Machado and Mourato, 1998; Landry et al., 2003). In previous studies, the age variable had both negative and positive effect on people willingness to pay.

Education impact on WTP was found to be in line with the established theory and others studies (Langford et al., 1998). So it is expected that people with higher level of education can understand the need for managing environmental resources better than other who are not well educated.

In the multiple regression model formulation three more variables were included to define respondents' environmental preferences and attitudes towards future management of coastal zone. According to our empirical results, the motivation behind WTP is mostly based on individuals' expectations for coastal area future tourism development, followed by coastal environment management and coastal zone protection. There are a great number of studies that tries to explore how beach attributes (beach access, water quality etc) influence people's WTP. According to the results people are willing to pay for improving beach water quality (Goffe, 1995; Kaoru, 1993), site facilities (Lew and Larson, 2005) and coastal access (McGonagle and Swallow, 2005).

Summarizing our findings, we may say that our study provides evidence that a great number of respondents were willing to pay for improvements in quality of coastal zones. Moreover, individual characteristics have distinctively different effects for explaining respondents' behavior against coastal zone economic valuation. The empirical results from the proposed models link use and existence values and site characteristics with individuals' opinion about economic value of coastal zone and people's total WTP. Our findings are consistent with prior expectations.

It is worth mentioning that our study is specifically aimed at generating data on the economic value of coastal zone so that decision and policy makers can better

determine the optimal management strategy. In other words, our study attempts to inform the process of determining a more desirable (Pareto improving) management plan, relative to the current plan, from the public point of view.

Environmental resources management must aim to establish a balance between environmental protection and economic efficiency. Decisions regarding the future management of coastal resources must be focusing on changes to the various service flows that emanate from them under alternative management strategies. The values held by society for the alternative outcomes – including environmental service flows such as recreational opportunities, fishery production and number of endangered species – are key to an understanding of which alternative will yield society the greatest net benefit.

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