

Full Length Research Paper

## An economic assessment of the Ramsar site of Massa (Morocco) with travel cost and contingent valuation methods

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As the only protected area in the whole south west of Morocco, the Souss Massa National Park (SMNP) is characterized by a remarkable biodiversity, with more than 300 plants species, 250 bird species, 20 mammal species and also by the high diversity of its ecosystems, such as the *Aragnia spinosa* forest, steppes, dunes and coastal wetlands. This park can play a leading role in the region by enhancing its ecotourism potential and therefore contributing to its economic development. We intended to demonstrate in this study, by estimating the recreational value, one popular area, the RAMSAR site of the Estuary of Massa River (EOM). It is located 50 km from the urban center of Agadir City and it attracts about 30,000 visitors a year. To determine its recreational value, the contingent valuation method and travel cost method were applied. The results from 480 surveys, conducted during 2010, showed that the consumer surplus per person per visit is estimated at DH 490,196 (\$US 65.36) and the willingness to pay per visitor is about DH 46,523 (\$US 6.20). According to this economic valuation, any future local development must take into account, the opportunity that EOM offers as a recreational site, with high ecotourism potential.

**Key words:** Estuary of Massa River, recreational value, contingent valuation, travel cost method, willingness to pay, consumer surplus.

### INTRODUCTION

Since the Earth Summit in Rio in 1992, the attention paid to the biodiversity conservation grows in importance in the strategies and socioeconomic development programs undertaken by the international community. Protected areas (PAs) are one of the most used models for the protection and preservation of biodiversity, and a real research field for the development of approaches and plans for conservation and sustainable use of natural resources.

National parks have been established in many countries to preserve ecosystems and provide for the

recreation, wilderness and leisure demands of the population (Herath, 2004). Indeed, National parks or generally protected areas normally hold a high value as a recreational resource or destination (Navarro et al., 2010). Like many others countries, Morocco has been committed from the nineties, to protect and preserve the environment and biodiversity, through the elaboration and implementation of national strategies, which has led to establishing a national network of PAs that actually include nine national parks, with a total area of 600,000ha (Ribi,2007).

Despite different ecosystem services provided to society, the natural resources are often underestimated in terms of their contribution to the local and regional economic and social development (Ruzzier, 2010). Protected areas are considered by some stakeholders as an obstacle to local development despite their roles in the conservation of biodiversity and the potential opportunities they present for recreation and ecotourism development.

Economic valuation of national parks is an important source of information both for park managers and for society in general (Alvarez and Larking, 2008). Several economic methodologies have been developed in the last decades to approximate the value of non-markets environmental goods and services such as recreational value. Economic valuation techniques can be used to measure the benefits associated with environmental conservation projects and nature tourism activities (Mathieu et al., 2000).

Mehmet and Türker (2006) claim that the Travel Cost and Contingent Valuation Methods (TCM and CVM) are the most widespread and used methods, to estimate the recreational value of forests and protected areas around the world. A series of studies on this topic was conducted at the continental level but few results have been published. Recently in Ghana, Twerefou and Adjei Ababio (2012) used the TCM to estimate the value of recreation at Kakum National Park.

There is very little knowledge on the recreational value in protected areas in Morocco. The aim of this research was to assess the recreational value of the Ramsar site of Estuary of Massa River (EOM) and to show policy makers the economic importance of protected areas.

## MATERIALS AND METHODS

To achieve the study objectives of the economic assessment of recreation in the Ramsar site of EOM, we used the following two methods:

### The contingent valuation method (CVM)

The contingent valuation method was applied for the first time by Quotes and Robert in 1963 for the valuation of natural assets. It is used by economists because of its relative simplicity (Cumming et al., 1986). It is based on the reality of an investigation during which it is shown directly to individuals surveyed what they would pay to preserve or restore an environmental good. In other words, this is to simulate a fictitious market in which the individual can directly reveal his preferences and willingness to pay for goods or services from nature.

Bateman and Turner (1993) noted that the CVM requires that individuals express their preferences according to some environmental resources or change in resource status, by answering questions on hypothetical choices. For example, for individual  $i$ :

$$WTP_i = F(Q_i, Y_i, T_i, S_i) \quad (1)$$

Where:  $Q_i$ , the quantity or quality of environmental good;  $Y_i$ , the

income of the individual  $i$ ;  $T_i$ , the preferences of the individual  $i$ ;  $S_i$ , other socio-economic variables of the individual  $i$ .

### The travel cost method (TCM)

This method has been applied to estimate the demand and consumer surplus for wildlife and nature conservation at recreation sites. The demand for a park is estimated by determining the change in visits as the cost per visit is changed (Siti, 2009). TCM studies have consistently shown that as the price of access (cost of travel) increases, the visit rate to site falls (Garrod and Willis, 1999). The TCM simple model is usually estimated as a trip generating function such as the following:

$$V = f(C, X) \quad (2)$$

Where:  $V$ , Number of visits to a recreation site;  $C$ , costs per visit;  $X$ , other socio-economic variables, which significantly explain  $V$ .

There are two types of data used in the TCM: Zonal and Individual TCM. For the first one, the visitors are grouped into different categories or zones based on certain similar characteristics such as geographical origin. This is the oldest form of the travel cost method (Timah, 2011). The second was the precise number of site visits made by each visitor over a specific period. The ITCM uses survey data from individual visitors in the statistical analysis, rather than data from each zone. However, the ZTCM has been under serious criticism recently for its vagueness as a non-market valuation tool. For this reason, most researchers and economists have now turned to the ITCM as a better option (Bell and Leeworthy, 1990). In this study, the ITCM was applied to evaluate the recreational value of the RAMSAR Site of the estuary of Massa River. The Equation 2 can be rewritten as:

$$V_{ij} = f(C_{ij}, X_i) \quad (3)$$

Where,  $V_{ij}$ : Number of visits made per year the individual  $i$  to recreation site  $j$ ;  $C_{ij}$ : visit cost by the individual  $i$  to recreation site  $j$ ;  $X_i$ : all other socio-economic variables determining individual visits.

The demand curve produced by the ITCM relates individual's annual visits to the costs of these visits. Integrating under this curve gives us the consumer surplus per individual (ICS). Multiplying the ICS by the number of individuals visiting the site annually helps to estimate the consumer surplus for the recreational site:

$$\text{Total consumer surplus} = N_j \cdot \int f(C_{ij}, X_i) \cdot dC_{ij} \quad (4)$$

Where,  $N_j$  is the number of individual visits to recreation site  $j$  per year,  $C_{ij}$  and  $X_i$  are defined as in Equation 3 (Bateman, 1993).

Another way to calculate Individual consumer surplus is to use the following formula for the semi-log function (Willis and Garrod, 1991):

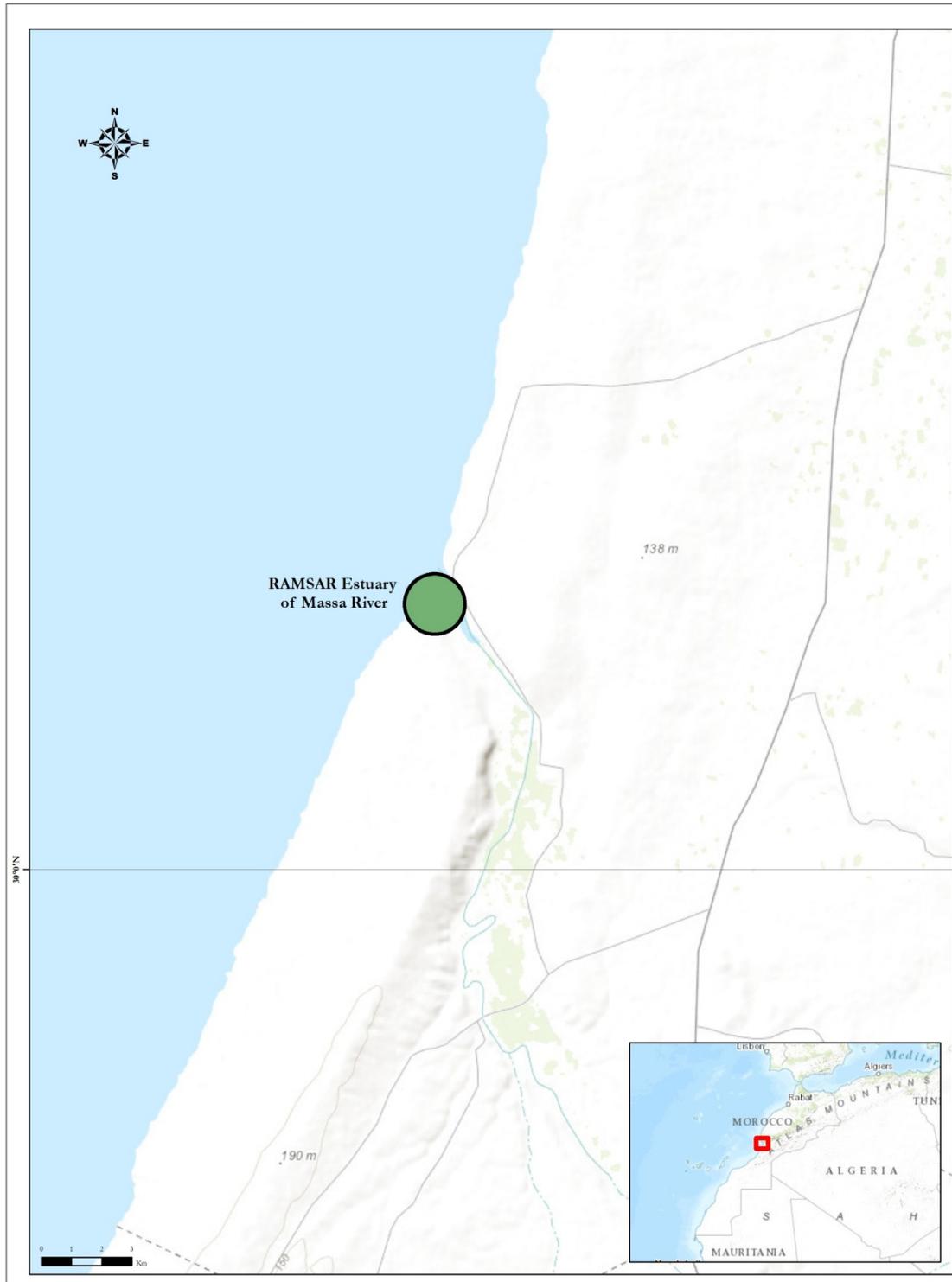
$$CS = -1/\beta_{ij} \quad (5)$$

Where,  $CS$  is the consumer surplus per person trip and  $\beta_{ij}$  is the coefficient of travel cost  $C_{ij}$ .

The total annual consumer surplus obtained from the recreation site can be calculated by multiplying the ICS with the number of visits made in a year.

### The case study

This study shows the RAMSAR site of the estuary of Massa River,



**Figure 1.** Localization map of the studied site.

located on the Atlantic coast of Morocco on an area of 1200 ha (Figure 1). This site forms the central part of the Souss Massa National Park (SMNP) and one of the richest areas in the park, as far as natural resources are concerned. The site seasonally hosts

over thirty species of waterfowl, some of which are among the rarest as spoonbills, flamingos, cranes, glossy ibis and marbled teal. It also holds some of the most endangered birds in the world: the bald ibis and the Audouin's Gull (El Bekkay, 2009).

**Table 1.** General data related to recreation at the estuary of Massa River.

Variable	Units	Minimum	Maximum	Mean	SD
Age	Year	20	76	43.823	8.252
Annual visit number	Number	1	4	1.433	0.664
Distance from site	km	10	60	49.006	5.394
Time at recreation site	Hour	1	6	2.119	0.865
Number of children	Number	0	5	1.040	1.131
Total travel cost	Number	15	900	355.110	99.724
Monthly income	MDH	0	36000	16086.458	5538.511
WTP	Number	0	120	41.708	20.116

Managed by the High Commissary for Water and Forests and the Fight against Desertification, the estuary of Massa River is visited, all year round, by tourists in search of recreation in natural site. Open freely to the public, this estuary offers to visitors an original and outstanding landscape that combines different components, not often observed in nature: river, dunes, vegetation and sea, which draw about 30,000 visitors annually. In order to estimate the recreation value of the estuary of Massa River, a total of 480 surveys were carried out at the site, during a face to face interview. The monitoring started in January and finished in December 2010. Surveys dating were conducted monthly to consider the different categories of visitors.

In this study, we used a survey form with 32 questions and conducted 480 surveys which helped to build a database large enough to estimate the recreational benefits of the RAMSAR site of the estuary of Massa River.

The first part of the survey form focuses on the identification of visitors and their social and economic data. The second part is on the behavior of visitors, their activities on the site, the number of the visits and their recommendations to improve the quality of the recreation at the Ramsar site of the estuary of Massa River. Finally, the third part aims to identify the level of awareness of interviewed people about the environment protection. The WTP was asked through an open question: What is the maximum amount you are willing to pay for improvements of the recreation site quality? An index card showing the proposed entrance fee, from 0 to 120Dh, was shown to the respondents; this card is the visual support of this valuation.

## RESULTS

The contingent valuation method based was on a survey in which we seek, with appropriate information questions, the preferences of individuals and the amount each would be willing to pay for the preservation or restoration of an environmental good.

The descriptive results of the study sample of the Ramsar site of the Massa River are data of great value which can help in understanding visitor behavior. 7% of visitors were under 30 years old, 71% between 30 and 50 years and 20% were over 50 years. An effort should be made to develop an environmental education program to increase the rate of young visitors. Also, the distribution of the sample per months showed the presence of certain trends in terms of the variable visitor's age: those aged less than 30 years discover the Ramsar site of EOM

during the period between March and July. For visitors with an age between 30 and 60 years old, it seems that the frequency of visits is almost the same during the year. People with age over 60 years, visit the EOM mainly during the period of November to February, which could be explained by the period of the presence of the wintering migratory birds.

Fifty four percent of visitors are married and 220 interviewed persons have children, with a dominance of couples with two children (42%). It should be noted that 78% of the sample have a level of technical training or higher. When asked whether they knew the Ramsar site of Massa River, 47% of those surveyed gave an affirmative answer. However, 53% of visitors had never heard of the park, showing that a special work is needed in communication and advertising to improve the earnings of the site.

The survey results showed that 77% of visitors do not exceed two hours in discovering the site. Visitors were also interviewed on the quality of services and desired improvements: 71% of them would liked the ecomuseum to be open, 60% wished the site includes a cafeteria/restaurant, 45% of the visitors suggested the installation of viewpoints in the site fauna and 43% expressed their desire to see the access road maintained.

### Calculation of the willingness to pay

The WTP in our study is the dependent variable and the independent variables remain the socio-economic characteristics of the individual and specific characteristics of the studied site. Table 1 summarizes the key variables from our sample.

To develop the model on the WTP, this study was based on the same sample studied previously. The bid curve provides insight into the role of socio-economic characteristics of those interviewed on their willingness to pay for environmental goods and services.

The Recourse to use the regression, according to the Tobit model, is justified by the presence of several null offers: 69 people have expressed their willingness to pay

**Table 2.** The contingent valuation results.

Dependent variable	Model variable	Coefficient	t
WTP	CONSTANT	-19.497	-3.809
	INCOME	0.003	24.572
	NB_CHILD	-1.171	-2.125
	SATISFACTION	23.246	4.876
	TIME_VISIT	-6.991	-3.683
F	R	R <sup>2</sup>	Adjusted R <sup>2</sup>
186.871	0.796	0.634	0.631

**Table 3.** The results of regression analysis.

Model summary		R	R <sup>2</sup>	Adjusted R <sup>2</sup>	SD	
Semi-Log		0.6532	0.4266	0.4218	0.3419	
Analysis of variance						
Model type	Model	Sum of squares	df	Mean square	F	Sig.
Semi-Log	Regression	41.314	4	10.328	88.357	0
Coefficients	Residual	55.525	475	0.117		
Dependent variable	Model variables	Coefficients	SD	t	Sig.	
Ln(AVN)	Constant	1.1663	0.0951	12.26394	0	
	TTC	-0.00176	0.00014	-12.9425	0	
	AGE	-0.00539	0.0024	-2.24073	0.0255	
	NBCHILD	0.0621	0.01868	3.32468	0.001	
	EDU	-0.17802	0.04539	-3.92242	0.0001	

0 dirhams to improve the site characteristics of the EOM, 44 results correspond to offers of protest. The results for the regression are presented in the Table 2: The bid function is therefore written as follows:

$$\begin{aligned}
 WTP = & -19.497 + 0.003INC - 1.171NBCHILD \\
 & (-3.809)^* \quad (24.572)^* \quad (-2.125)^* \\
 & + 23.246SAT - 6.991 VISITTIME \quad (6) \\
 & (4.876)^* \quad (-3.683)^*
 \end{aligned}$$

where, WTP is the willingness to pay, INC, the income of the respondent, NBCHILD, the number of children of the respondent, SAT, the satisfaction of the respondent, VISITTIME, the time spent on site by the respondent. Numbers in parentheses correspond to the values of t-Statistics; a cross indicates that the variable is significant at 1%. According to the value of R<sup>2</sup>, f and t-Statistics, the willingness to pay was found to have a good correlation with some socio-economic variables of the visitors. As expected at the beginning of this study, it appears clearly from the bid function that the visitors with higher income and satisfied with their visit were willing to pay more for the conservation and improvement of the site quality. Also, the number of children of the visitors is a variable negatively related to the WTP. By setting variables in the

Equation 6 to their average, we obtained the average WTP which is in the range of 46.523 Moroccan dirhams (\$US 6.20).

**Calculation of the recreational value**

One of the purposes of this research is to determine the use value of recreation site at the estuary of Massa River via the use of the estimated consumer surplus means. The semi-log function was used by specifying the number of visits per year which is the dependent variable. Age, income, total expenses of the trip, the distance traveled to visit the EOM, etc., are the independent variables. Table 3 relates the results of the regression of the variation in the number of annual visits with the explanatory variables.

According to the Fisher F-values and t-Student and R<sup>2</sup>, the semi-log function is significant at a level of 99%. The function of the application may be written as follows:

$$\begin{aligned}
 Ln(AVN) = & 1.1663 - 0.00176TTC - 0.00539AGE + \\
 & 0.0621NBCHILD - 0.17802EDU \quad (7)
 \end{aligned}$$

It appears from this demand curve, that the sign of the

coefficient of the variable "total travel cost" (TTC) is negative and therefore it is inversely proportional to the exponential increase of number of annual visits, which is consistent with the results of ITCM found in the literature.

### **Calculation of consumer surplus**

Correcting the model of the demand curve in order to maintain TTC as the main explanatory variable, the Equation 7 becomes:

$$\ln(\text{AVN}) = 0.95778 - 0.00204\text{TTC}$$

It is necessary to calculate at first the consumer surplus per person per visit, and then the total consumer surplus will be estimated by using the formula referred to above (5):

$$\text{CS} = -1 / (-0.00204) = 490.196 \text{ DH (65.36 US\$)}$$

The total annual consumer surplus obtained by site visitors from the estuary of Massa River can be calculated by multiplying the individual consumer surplus by the number of visitors to the site of the EOM (30,000 visitors a year). Then, the value of individual consumer surplus per visit is about 490.196 DH (65.36 USD), and the value of total consumer surplus is estimated at 14.7 million DH (1.96 million dollars).

## **DISCUSSION**

One of the most visited sites in the Souss Massa National Park, the estuary of Massa River offers considerable bio-ecological value, to develop recreation and ecotourism. The contingent valuation method and travel cost method are among the most often used techniques that attempt to assign monetary values to goods and services provided by environmental resources. As part of this research, 480 interviews were conducted to assess the monetary value of recreation site, using the two methods mentioned above.

According to our results, the ITCM has enabled first, the calculation of the consumer surplus per person per visit at about 490.196 DH (US\$ 65.36), and second the estimation of the value of recreation to be about 14.7 million dirhams (1.96 million US\$). In parallel, the willingness to pay for the improvement of services, offered by the site of the EOM was calculated by using the CVM, the WTP was estimated by the bid curve to 46.523 dirhams (US\$ 6.20).

Comparable studies have been undertaken to approach the recreational value of protected areas, especially national parks in different regions of the world. For example, in Egypt, using the ITCM, the CS related to the visit of the coral reefs in Ras Mohamed National Park was estimated at US\$2,280, and the WTP, according

to tobit regression, was US\$ 6.57 (Rady, 2006). In India, the individual consumer surplus for visiting the Periyar National Park was evaluated to be US\$ 36.18 (Bulov and Lundgren, 2007). Twerefou in 2012 indicated that the consumer surplus for visiting Kakum National Park in Ghana was about US\$ 46.40. In Australia, the average WTP for visiting Mont Buffalo national park was assessed at US\$ 13.15 (Herath, 2004). The WTP to moderate the environmental impact of inland development in marine parks in Malaysia was estimated to be US\$ 7.89 (Siti, 2009).

Taking into account these values and in the absence of similar studies in the other Moroccan protected areas, we have tried to compare our results with those found in some Mediterranean and Arab countries where comparable studies was conducted. The first example is related to recreation in Kayabaşı Forest (KF) in Turkey (Mehmet and Türker, 2006), the second one shows the recreational benefits of Dibeen National Park (DNP) in Jordan (Amer and Said, 2006). Using the TCM, the average value of the recreation was respectively estimated at US\$ 22.11 and US\$ 100. On the other hand, the willingness to pay, to conserve and to improve the services in the two sites has been estimated in KF to be US\$ 1.01 and in DNP to be US\$ 7.9. According to these cases, it appears clearly that the recreational value of the estuary of Massa River is at the same level of recreation as those recorded in other sites in the developing countries. The relative high values of WTP and CS of Massa Estuary can be explained by the attractiveness of the site and also by the lack of other possibilities to discover the wildness in the Agadir region.

The results show that the value of recreation-based on TCM is higher than the one generated by the CVM. Several authors have already compared the results obtained by the contingent valuation method with those of the travel cost method. They concluded that the economic value of the contingent valuation method is lower than the one obtained by the method of travel cost (Carson et al., 1996).

## **Conclusion**

The monetary values of the recreation in the Estuary of Massa River, estimated by the TCM and CVM, reflects the exceptional potential of the site for economic development in the region, which must be taken into account, by both managers as local communities of the EOM. These values, as well as the other results in this research, should be taken into consideration, at every decision-making regarding any intended use of the site. In fact, this kind of study should be extended to other similar sites, dedicated to preservation and development of natural resources in Morocco, in order to demonstrate to all stakeholders, through economic criteria, the benefit which could be drawn from the valuation of natural resources.

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