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Research Paper

Estimation of rehabilitation and protective value of Jazmoryan wetland by the use of Conditional Valuation Method

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Abstract: Effective role of natural resources in sustainable development and natural ecosystem preservation has caused environmental and natural resources economists focused on non-market role of these resources in recent years. Therefore with valuation of natural resources and environmental systems these resources are prevented from destruction and excessive exploitation. This study was done in order to determine reclamation and protective value and also people tendency to payment for Jazmoryan wetland conservation by the use of Conditional Valuation Method. The sample content was determined with cochran formula and 111 questionnaires were completed in 2014, verbally. According to the results, the amount of each person tendency to payment was assessed 3030 Rial and the whole tendency of study area was calculated 23.09 Milliard Rial. The results of logit model by maximum likelihood method showed that recommendation, age, family, income and education variables had significant effect on acceptance probability of price. Age and recommendation variables had negative effect and family dimension, education and income had positive effect. Final effect of recommendation variable was calculated – 0.0003, it means that if proposed price has increase of 1%, acceptance probability of proposed price would decrease about 0.0003 units.

Keywords: Conditional Valuation, Logit Pattern, Jazmoryan Wetland, Conservative Value, Willingness to Payment

Introduction

Wetlands and aquatic ecosystems are valuable stocks that estimation of all values of them is not easy. Wetland ecosystem provides many goods and services that help human welfare even if these services have no price in market (majnonian, 2012). The current world has always faced major environmental crises. Problems such as the loss of the ozone layer, Global warming, the effects of greenhouse gases, increase of pollution and different pollutants, destruction of natural ecosystems particularly tropical forests and wetland are all the evidence of such crises. (Khorshid dust, 2004). Lack of proper understanding of functions and services produced by these resources, is a serious threat to society. In fact, lack of awareness of these services value, such as environmental and social impact, causes their destruction. So calculating natural resources value and knowledge of the benefits that are lost because of environmental resources destruction, is so important. Because this increases the incentive to protect them and leads to willingness to pay for natural resources conservation (Salami et al, 2011). Pricing environmental functions that are generally without price is an important step to correct economic decisions that regard natural environment as free goods and

services (Majabi And Monavari, 2005). So pricing on non- market functions and services of natural resources and environment is so important for many reasons including identifying and understanding the environmental and ecological benefits, creating linkage between economic policies and revenues earned by natural resources, evaluating the importance of environmental resources in improving human welfare and sustainable development, adjustment and modification of national accounts such as national impure production and preventing damage and uncontrolled exploitation of natural resources (Molaei And Kavoosi, 2011). Many studies have been done about this issue by the use of Conditional Valuation Method (CVM) for example:

Leong et al (2005) investigated protective value of mountainous area forests in Malaysia and concluded that protective value per visitor is in the range of 20 to 27 currencies.

Gurluk (2006) estimated value of ecosystem services equal to 67.44 dollar per family in one year in an area in turkey. In lobnan, Sattout et al (2007) calculated recreational value of cedar forest equal to 42.43 dollars by the use of CVM. . Reynisdottir et al (2008), the average willingness to pay as the entrance to the National Park and Gull Foss Askaftafl Ireland using contingent valuation method, respectively 508 and 333 million kroner Iceland calculated. Nabin et al (2008) by the use of CVM and logit model showed that the average of visitors' tendency for paying to conserve a protected area is 69.2 dollars in Nepal. In the study, Weber and Stewart (2009) by the use of selection modeling method, wanted visitors to rank different senarios for a river reconstruction project in the central part of New Mexico. They concluded that tendency to annual payment for the river reconstruction is 156.6 dollars per family or 9.21 dollars per mile. In the study, Saleh et al (2014) evaluated conservative value and effective factors on people tendency to payment in a wtland in Marzon Abad in Babol, their study showed that each person tendency to pay for the wetland protection is equal to 56364 Rials monthly and the average of conservative value per family is equal to 235037.88 Rials. Ahmad sam daliri et al (2013), in a study, evaluated Chalus citizens tendency to pay for protection of Valasht Lake by the use of Conditional Vluation Method and conluded that 67% people in the study area have tendency to pay for protection of water resources an the average of tendency for payment is equal to 26175 Rials monthly. In the other hand the whole conservative value of this lake is equal to 6994 milion Rials annually. Jafari nejad et al (2012) evaluated the intrinsic value of Gomishan wetland in Golestan province by the use of CVM, their study showed that income and education have the most effect on native and non-native communities' tendency for protection of wetland. According to global approved indicators, economic value of Gomishan wetland was determined equal to 0.201 milliard dollars per hectare. Zebar dast et al (2010) calculated non- use value of Anzali wetland equal to 88039.2 Rials annually by the use of CVM.

Jazmoryan wetland is located on south of Kerman and is effected by Bampour and Hallilroad rivers. Despite of environmental and ecological value of this wetland, it isn not protected under different protective titles unfortunately and different environmental factors and also the effects of human activities have caused the wetland to become dry. Because of significant importance of this wetland in protection of natural ecosystems of Iran, this study is trying to evaluate rehabilitation and conservative value of this wetland and also amount of willingness for paying per family by the use of CVM.

Martial mad Methods

The study area

Jazmoryan wetland is located on 5839E to 5914E and 2710N to 2738N, between Kerman province and Sistan-Baluchestan. It is located between Makran Mountains and Shahsavaran and is spread about 300 Km from east to west and 100 Km from north to south. Vegetation is named JAZZ in local terms and density of them is named MORYAN, So the area is famous as JAZMORYAN. Area of its basin is 69000 Km2 and its height is 300 meters. The area of the catchment is 69,000

km2 with elevation above sea level as 300 m. the full water-catching area of the Lake in times of high water was 3300 km2 and in low water times was 2500 km2. Figure 1 shows the study area location.

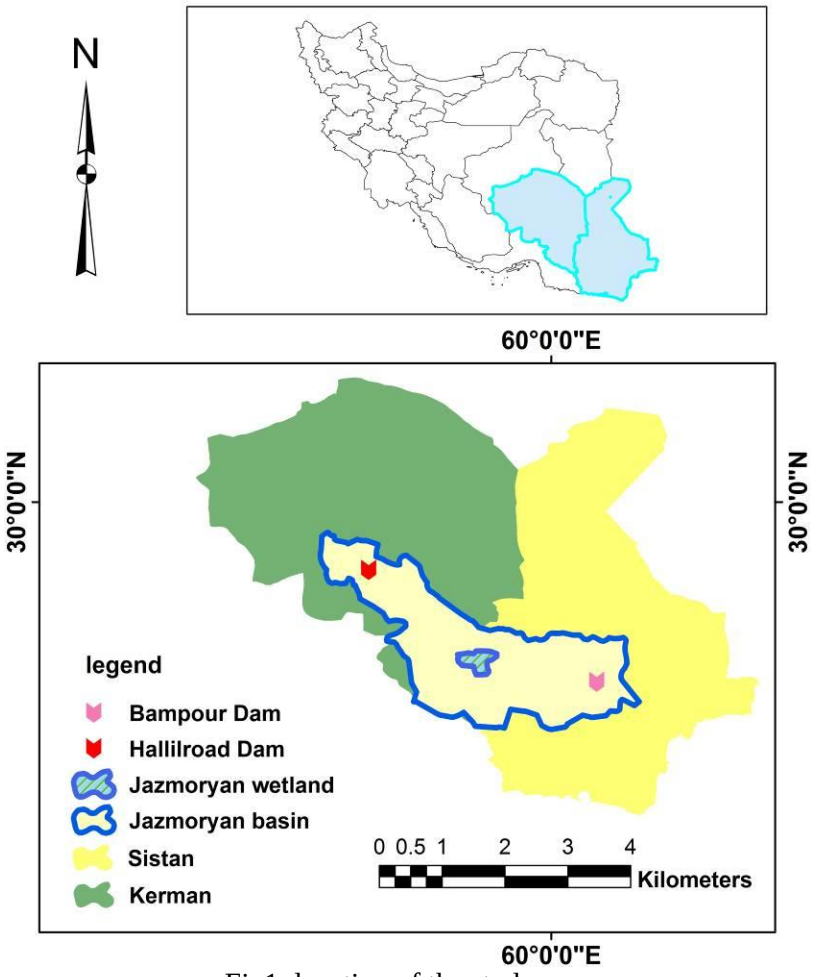

Fig1: location of the study area

Methodology

In this study, conditional valuation method was used for evaluation of rehabilitation and protective value of Jazmoryan wetlands. This method is usually used as a standard and flexible tool for estimating non -consuming value of environmental resources. This method was proposed in 1947 by Ciriacy-Wantrup for the first time. But Davis used that experimental, in 1963 for the first time. The CVM method tries to determine people tendency for payment in certain hypothetical market scenarios. This method seems to be simple. Downright, a group of people are asked that how much they have tendency to pay for special merchandise (Amir nejad & Khalilan, 2005). People tendency to payment for environmental resources shows economic value of them. In economic theories, consumer welfare, with an estimated change in surplus and compensatory changes that reflect the willingness to pay for goods is measured (Bocksteal and Mc Connell, 2007). To measure people tendency to payment for determining conservative value of this wetlands and also effect of independent variables as income, education, age, gender, Logit model was used. Double bounded dichotomous choice questionnaire (DBDC) was used for measuring tendency to payment in order to protect JAZMORYAN wetlands in CVM. In this method, the initial suggested amount is offered, if the answer to that was positive, then the second suggested amount that is more than the initial amount, is offered. And if the answer to initial amount was negative, the second suggested amount is less than the first amount (Bateman etal, 1999). To achieve this goal, 30 questionnaires were

completed, and then 20000 Rial was offered as the first suggested amount. So 40000 Rial would offered as the second suggested amount if the answer to the first amount was positive and 10000 Rial would offered if the answer was negative.

Utility of the study population is affected by income and other socio-economic characteristic of them. In DBDC method, it's assumed that people have the following utility function (Khodaverdizadeh et al, 2010):

$$U = u(Y, S) \quad (1)$$

U: indirect utility function

Y: individual income

S: vector of other socio-economic characteristic

Each visitor is ready to pay amount of his income for the use of environmental resources as the suggested amount (A). Created utility caused by the use of environmental resources is more than when he does not use the environmental resources and the following relation shows that (Khodaverdizadeh et al, 2010):

$$U(1, Y - A; S) + \varepsilon_1 \geq U(0, Y; S) + \varepsilon_0 \quad (2)$$

ε_0 and ε_1 are random variables with average zero that are distributed randomly and independently. Difference in utility caused (ΔU) by the use of environmental resources is as following (Khodaverdizadeh et al, 2010):

$$\Delta U = (1, Y - A; S) - U(0, Y; S) + (\varepsilon_1 - \varepsilon_0) \quad (3)$$

The structure of dichotomous questionnaire has a dependent variable with dichotomous choice in assessment of people tendency to payment. So logit model was used to investigate the effect of different explanatory variables based on visitors WTP (willingness to payment) for determining the recreational value. Based on logit model, posibility of accepting one of proposals by people is according to following relationship (Khodaverdizadeh et al, 2010):

$$P_i = F_n(\Delta U) = \frac{1}{1 + \exp(-\Delta U)} = \frac{1}{1 + \exp\{-(\alpha - \beta A + \gamma Y + \theta S)\}} \quad (4)$$

$F_n(\Delta U)$ is commulative distribution function with a standard logistic difference and includes some socio-economic variables such as income, proposed amount, age, gender and education. β, γ and θ are coefficient expecting to be $\gamma > 0$, $\beta \leq 0$, $\theta > 0$.

There are three ways for calculating WTP: the first way is named WTP average that is used for calculation of expecting amount of WTP by numerical integration in the range of 0 to ∞.

The second method is named total WTP average that is used for calculation of expecting amount of WTP by numerical integration in the range of $+\infty$ *to* $-\infty$. And the third method is named partial WTP average that is used for calculation of expecting amount of WTP by numerical integration in the range of 0 to maximum recommended (A). Among these methods, the third method is better and it is calculated according to following relationship (Khodaverdizadeh etal, 2010):

$$E(WTP) = \int_0^{\max A} F_n(\Delta U)\, dA = \int_0^{\max A} \left(\frac{1}{1 + \exp\left[-(\alpha^* + \beta A)\right]} \right) dA$$

$$\alpha^* = (\alpha + \gamma Y + \theta S) \quad (5)$$

E(WTP) is expecting amount of willingness to payment and α^* is adjusted y intercept That is added to original y intercept sentence by socio-economic sentence (Khodaverdizadeh et al, 2010). Finally, according to cochran formula, 111 questinnaires were completed by people who live around the

wetland bye the use of random sampling in 1393. In the first section, information questionnaire about socio- economic features was collected and in the second section, information about people willingness to payment for rehabilitation and protection of JAZMORYAN wetland was collected. In this study, logit model parameters were calculated by the use of Maximum Likelihood method and shazam9 software.

Results

For better understanding of socio- economic features, prepared data were analyzed. Socio- economic features of study samples are provided in table 1.

Table 1: Socio- economic features of study samples (descriptive statistic of explanatory variables)

Variable description	Variable type	average	Standard deviation	minimum	maximum
age	Continues	29.7	10.48	15	63
Gender	discrete	0.73	0.44	0	1
education	Continues	12	5.06	0	19
Number of family members	Continues	5	2.114	3	10
Income (Rial)	Continues	5060000	372.307	450000	20000000
Membership in environmental support organization	discrete	0.03	0.18	0	1

In regard to questionnaires and table 1, it is obvious that most of samples were men including 72.9 percent of respondents and 27.1 percent of respondents were female. Also average of respondents' age was 29.7. The minimum age was 15 and the maximum was 63 the average educational years of respondents was 12, with minimum and maximum of 0 and 19 years, respectively. 4.5% of respondents had M.s degree or higher, 37.83% had associate degree and bachelor degree, 47.77% had diploma and lower and 9.9% were illiterate. The average of each family member was 5 persons, that minimum of this was 3 and its maximum was 10 persons. Also, average income of respondents was 5060000 Rials, its minimum was 450000 Rials and its maximum was 20000000 Rials.

Table 2: consumers' willingness to payment

Admission status	discription	Minimum proposal (10000 Rial)	Middle proposal (first) (20000 Rial)	Maximum proposal (40000 Rial)
Admission	Number	24	55	28
	percent	21.63%	49.54%	25.22%
Rejection	Number	32	56	27
	percent	28.82%	50.45%	24.33%
total	Number	56	111	55
	percent	50.45%	100%	49.55%

According to table 2, 56 persons did not accept the first recommendation and did not have willingness to pay 40000 Rial for protection of wetland. 55 persons accepted it. When the minimum proposal was provided, 32 persons did not accept it and 24 persons accepted it. Those respondents

that accepted the first recommendation placed on maximum proposal that if they were ready to pay 40000 Rial for protection of wetland or no. 28 persons accepted the third recommendation and 27 persons rejected it.

In order to investigate effective factors on willingness to payment and effectiveness of each variable, logit pattern was calculated by Maximum Likelihood Method. The result is shown in table 3.

Table 3: The study area logit model estimation

Variables name	coefficients	Standard deviation	stretching in average	Final effect
Recommendation	-0.001***	0.0003	-0.870	-0.0003
Age	0.259***	0.039	-3.481	-0.064
Family dimension	0.224**	0.094	0.501	0.057
Education	0.080**	0.038	0.267	0.020
Income	0.483**	0.227	2.976	0.120
Gender	-0.009	0.411	0.003	-0.002
Y intercept	1.537	3.679	0.696	-
R2 MADDALA	0.42	Forecast accuracy percentage	0.87	

Resource: study results (*,** and *** are significant at 10, 5 and 1 percent levels, respectively)

According to obtained results, the recommendation, age, family, income and education variables had significant effect on acceptance probability of price. Age and recommendation variables had negative effect and family dimension, education and income had positive effect. Percentage of forecast accuracy was 87% that shows high predictive power of the model. The coefficient of determination was equal to 0.42 that is acceptable in double choice models.

Results show that if proposed price has increase of 1%, acceptance probability of proposed price would decrease about 0.0003 units. Also, if a person income has increase of 1%, probability of payment by that person would increase about 2.976. The average expecting amount of WTP that presents rehabilitation and protective value of wetland was calculated after estimation of logit model parameters by the use of Maximum Likelihood and by numerical integration in range of 0 to maximum recommendation that was equal to 1000000 Rials.

$$E\left(WTP\right)=\int_{0}^{\max A}F_{n}\left(\Delta U\right)dA=\int_{0}^{\max A}\left(\frac{1}{1+\exp\left[-\left(\alpha^{*}+\beta A\right)\right]}\right)dA = 3030 \text{ Rial}$$

In the above integral, amount of WTP was gained 3030 rial. For estimation of total willingness to payment in the study area, we should multiply the study area population by tendency to payment. So the whole willingness to payment in the study area was calculated equal to 23.09 Milliard Rial.

Conclusion

In this study by the use of conditional valuation method, amount of willingness to payment for rehabilitation and protection of JAZMORYAN wetland was calculated in the range of 0 to maximum recommendation after estimation of logit model parameters based on Maximum Likelihood method and by the use of integration. It was equal to 3030 Rial. According to obtained results, recommendation, age, family, income and education variables had significant effect on acceptance probability of price. Age and recommendation variables had negative effect and family dimension, education and income had positive effect. Percentage of forecast accuracy was 87% that shows high predictive power of the model. The coefficient of determination was equal to 0.42 that is acceptable in double choice models.

Results showed that 85% of families are ready to pay for rehabilitation and protection of wetland and they have tendency for rehabilitation and protection of wetland, wildlife and vegetation protection, use of wetland in future and protection of wetland for future generations.

Following recommendations are provided for rehabilitation and protection of the wetland:

- Income was an important and effective factor on people tendency to payment. Those who have lower income, have lower tendency for recreational use of the area. So it is recommended that government use policies that reduce poverty in society.
- People education was an effective factor on willingness to payment. So public education is a policy that government should use for rehabilitation and protection of the wetland.
- In regard to the importance of wetland and natural resources, government supervision on landuse changes around wetland and also prevention of dams' construction in front of water, is an appropriate solution for protection of this valuable resource.
- In regard to positive effect of the number of education years on willingness to payment, it is recommended that Considering the highly significant effects of education level on the tendency of families to payment for protection of the Jazmoryan Wetland, it is suggested that strategists and planners increase levels of knowledge and information among people about Jazmoryan Wetland through mass media, brochures, effective (targeted) advertisements, in order to absorb sufficient investments in this regard.
- Due to the vastness of natural areas such as wetlands and incapability of government in supporting all of the aforementioned natural sources, the requirement of using public financial participation in protecting wetlands and preventing them from drying out, could be witnessed.

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