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ORIGINAL ARTICLE

Economic valuation of Shadegan International Wetland, Iran: notes for conservation

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Abstract Wetlands are among the most productive ecosystems on the earth. They produce various market and non-market goods and services, which have a significant role in human welfare. Despite the great opportunities from sustainable development, wetlands all over the world are under serious threat from a diverse range of non-sustainable activities. One of the major reasons for excessive depletion and the conversion of wetland resources is due to underestimating the non-market values of wetlands during development decisions. Shadegan International Wetland (SIW) in southern Iran is one of these wetland areas that is threatened by undervaluation and overexploitation from commercial activities. This study utilizes the contingent valuation method to estimate the economic benefits of SIW from the view point of peoples' willingness to pay (WTP). The logit model was defined based on dichotomous choice to measure individuals' WTP. The estimated mean WTP was US$ 1.74 per household as a onetime donation. This study concludes that the benefits of SIW to society could encourage managers to set priorities to ensure that the health of the ecosystem, its integrity, and its uniqueness would be conserved in a proper manner.

Keywords Shadegan International Wetland · Non-market value · Contingent valuation · Willingness to pay · Logit model

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Introduction

Iran's SIW illustrates stresses on wetland ecosystems around the planet: disorganized and unplanned construction occasioned by burgeoning human populations, wanton overexploitation of natural resources for commercial ends, negative and destructive impacts upon both animal and non-animal agriculture, uncontrolled expansion of industry and much more.

Wetlands support people's life through providing various products and functions (Brouwer et al. 1999). They are an important source of goods (e.g., food, fuel wood, fresh water, and construction materials) and services (e.g., pollution control, water treatment, nutrient deposition) (Turner et al. 2004). Most natural services provided by wetlands, such as habitats and aesthetics, cannot be capitalized into their market price (Roberts 1997; Shabman and Bertelson 1979). This property places them at risk from an underestimation of the real benefits, which they provide. Therefore, when development services such as agriculture, industry, construction, and urban development are marketable and the opportunity cost of natural services provided by wetlands is overlooked, markets will favor wetland conversion. Nevertheless, habitat and wildlife destruction does not go unnoticed. The more recent valuation methods that compare economic value of benefits from these natural assets with other economic utilities can help us to recognize their long-lasting contributions to human life. Considering the real economic benefits of natural resource, preservation against other shorter-term economic benefits could prevent further degradation and destruction of these natural assets.

Several methods are available to estimate both use and non-use values of the wetlands and other environmental aspects. The ultimate goal of these methods is to reveal the monetary value of an environmental resource more

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accurately, and in doing so, to facilitate decision-making process. Hanley et al. (2001) placed these valuation methods into the following groups: stated preference techniques, revealed preference methods, and production function method. While revealed preference methods are based on responses to an actual situation, stated preference methods are based on respondent's behavior under hypothetical situations.

The stated preference methods are the only way to estimate non-use values. These methods include contingent valuation method (CVM) and choice modeling analysis. Both of these methods are based on surveys in which the public is directly asked about their willingness to pay (or willingness to accept) for hypothetical changes in environmental quality or about choices between different levels of environmental quality and the price of each level.

The high-profile use of the CVM, and the subsequent US federal endorsement of it, helped to make it a broadly accepted method of environmental valuation. Data for CVM are gathered through a carefully designed questionnaire that describes hypothetical market in which the non-market goods are traded. The surveys generally include descriptions of the environmental goods and simulating the market in which it is hypothetically traded (Desvousges et al. 1998; Freeman 1993; Mitchell and Carson 1989).

Over recent years, there have been many studies on the economic valuation of wetlands.[1] Most of the studies utilized CVM to value particular goods or services provided by wetlands such as recreation, flood and water flow control, biodiversity maintenance, nutrient, and pollution absorption (Brouwer et al. 1999; Ragkos et al. 2006). References are Bateman et al. (1995), Azavedo et al. (2000), Loomis et al. (2000), Gren (1995), Thang and Bennett (2005), Gren and Scharin (2007). A few attempts, however, have been made to measure the total value of wetlands (Wattage and Mardle 2007). Examples are Costanza et al. (1997), Barbier et al. (1997), Schuyt and Brander (2004).

The literature shows there is a lack of information on the values of SIW. Only some of the market goods and benefits from SIW were quantified in studies by the Pandam Consulting Engineers (PCE) (2002). In another study, Zare-Maivan (2004) attempted to quantify the total economic value of the SIW, but the study used the recommended average from Costanza et al. (1997).

[1] Even more recently in 2007, the Economics of Ecosystems and biodiversity (TEEB) study established by the G8 and developing countries environment ministers. The aim is to increase global attention to biodiversity benefits and growing cost of biodiversity and natural ecosystems loss. TEEB tries by connecting policy makers to environmental conservation and its benefit find out solutions to prevent further ecosystem and biodiversity degradations.

Given that many of the direct and indirect uses of wetland resources are non-marketed, the research reported in this paper helps to fill this information gap by providing estimates of non-market values for the largest wetland of Iran. Specifically, estimates of the willingness to pay (WTP) could be a useful tool for improvements in the conservation of the wetland. Accordingly, a DC-CV method was conducted in four cities that surround the wetland (Fig. 1) in order to estimate the economic benefits of the non-market goods and services of SIW.

Shadegan International Wetland ecosystem

SIW lies at the head of the Persian Gulf in SW Iran and the Khuzestan province. This wetland is located within the 30°, 00′–31°, 00′N. latitude and 48°, 20′–49°, 20′E. longitude. With a total area of 537,700 hectares, it is the largest wetland of Iran. SIW gradually became the largest wetland in the Middle East with the demise of much of the Mesopotamian marshlands (UNEP 2001; PCE 2002). In 1975, it was designated as a Ramsar site and among the top 50 Ramsar sites in the world. In addition, it has been recognized as an important bird site and hence recorded as a wetland with international importance (Scott 1995; Evans 1994; PCE 2002). It is important to note that, while the Ramsar site includes the entire ecological boundary of the wetland, only the wild life refuge is conserved as protected area (Fig. 1) (PCE 2002).

The wetland provides critical habitat for a wide variety of aquatic species. It is also an important wintering ground, particularly as a resting and nesting habitat for the many birds migrating from northern Eurasia. The wetland's immense socioeconomic resources are significant to the rural population of the area. Shadegan town, from which the wetland has taken its name, is surrounded by the wetland. The major population centers around the wetland are Ahvaz in the north, Abadan in the southwest, and Mahshahr in the east. Many villages from the east, north, and west of the wetland are the residential sites of the rural population (PCE 2002) (Fig. 1).

Values of SIW

Shadegan's 110 plant species (that belong to 92 genera and 37 families) make it one of Iran's most ecologically diverse wetland treasures (PCE 2002). According to the International Union for Conservation of Nature (IUCN) criteria, three critically endangered plant species and a further three vulnerable species have been recorded in SIW (IUCN 2008; PCE 2002). To date, studies conducted in the SIW have discovered 40 species of mammals, 3 species of amphibians, 8 species of reptiles, 90 species of fish, and

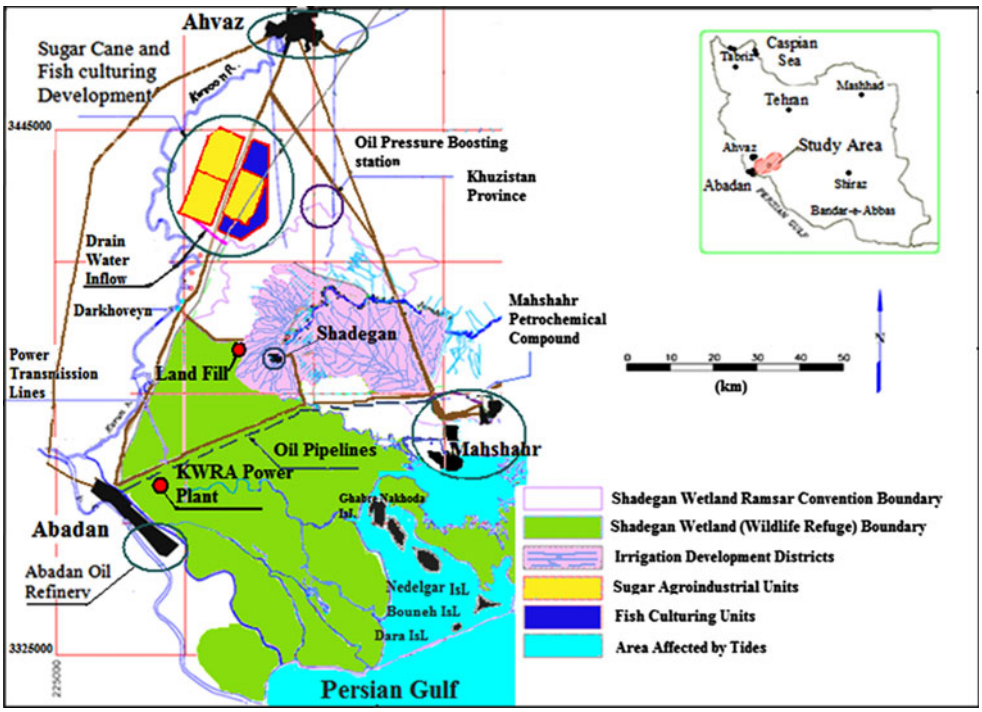

Fig. 1 Shadegan International Wetland. *Source:* adapted from PCE 2002

174 species of birds (Firous 2000; PCE 2002). These studies have indicated that SIW is particularly important for migratory birds because of the rich productivity of this ecosystem. Each winter, myriads of migrating water birds (particularly ducks and waders) winter in the SIW. Thirteen species of globally threatened birds such as the white-headed duck *(Oxyura leucocephala*), Marbled Teal (*Marmaronetta angustirostris*), and one endemic species, namely the Iraq babbler (*Turdoides altirostris*) have been recorded in this wetland (Scott 2001). These bird species, however, have not been reported in recent years.

Direct use values of SIW

SIW is an important source of socioeconomic benefits to the population around the area. There are about 90 villages with more than 400,000 households around the wetland that are highly dependent on its resources. About 300 households live inside the wetland (PCE 2002). Its fishery resource is an important economic contribution of the wetland for both family subsistence and income. Khur-e-Musa and its related estuaries are used for commercial fishing activities and marketed to other towns. In 2006, about 5,320 people are involved in the commercial fishing activities in SIW (Ansari and Mohammadi 2006).

The wetland also provides vegetation for livestock grazing, particularly buffaloes, cows, sheep, and goats. In addition, reeds are harvested for handicrafts such as mats and baskets and construction materials for fencing and roof covering. Migratory water birds are among the most important attributes of the SIW, and hunting is a significant source of income for the local population. It was estimated that the number of subscribed hunters was about 1,500 per year (PCE 2002). There are, however, no records available of the numbers and species of hunted birds. Nevertheless, despite the very interesting opportunities, the SIW offers such as natural scenery, fishing sports, bird watching, hunting, and recreation, the tourism industry in the area is still nonexistent (PCE 2002).

Threats to SIW

During the past several decades, the SIW has suffered various ecological assaults. The SIW confronts acute problems, where its ecosystem is threatened by the conversion of natural habitats and waste material and sewage from adjacent factories. Most recently, the nearby Abadan Refinery, the largest in Iran, dumped 35,000 cubic meters of oil sludge there, and so far, governmental organizations have failed to take any action to remove pollution from the ecosystem or prevent similar offenses in the future. According to PCE (2002) reports, examples of the development projects in the area are described as:

1. building of landfill site close to Rogbeh village (the wetland's ecological boundary) by the Municipality of Shadegan where the ground water in the landfill is in close contact with the marsh;
2. part of the land situated at the junction of the Ahvaz-Abadan and Abadan-Mahshahr highways is occupied

by the Abadan municipality and other government agencies for use as a bus and truck terminals;
3. about 100 hectares is occupied by the Khuzestan Water and Power Authority for the construction of a thermal power plant;
4. building of the Mahshahr Petrochemical Compound located inside the Ramsar site where the wastes of this compound are discharged directly into the wetland;
5. unprotected oil conveying pipelines that cross the entire wetland in an east–westerly direction causes severe corrosion and frequent breakages. Pipeline breaks this past decade discharged oil over the area, leading to a great many bird deaths, and threatening the wetland ecosystem in other ways; and
6. drainage outflows from 36,000 hectares of sugar cane, one large "carp" fish-culturing unit (about 10,000 hectares), a boosting station, an electric power plant and transmission lines, a thermal power plant inside the protected area, important export/import terminals, and the large industrial units around the wetland are other significant threats to SIW.

In addition to all of these threats, this wetland was considerably affected by the prolonged Iraq–Iran war and the 1990–'91 Persian Gulf War between Iraq and Kuwait. There is, however, no documented evaluation of damage to the natural resources of the wetland.

From the viewpoint of natural resources, the wetland is internationally important for its wintering waterbirds (particularly ducks in the freshwater areas and waders in the tidal areas). The numbers of wintering waterbirds have declined by almost one-half since the early 1970s (PCE 2002). The main losses seem to be among the herbivorous duck species, while fish- and invertebrate-eating species have increased. These changes may be the indications of eutrophication of the wetland (PCE 2002). There have been a dramatic declined in the following species: Greylag goose (*Anser anser*), Mallard (*Anas platyrhynnchos)*, Gadwall (*Anas strepera)*, Teal (*Anas crecca)*, Pintail (*Anas acuta*), Shoveler (*Anas clypeata)*, Marbled teal (*Marmaronettaangustirostis*), and Coot (*Fulica atra*) (PCE, 2002). The presence of 15,000–25,000 Marbled Teal (*Marmaronetta angustirostris*) in previous years suggests that about 30–60% of the world population of this species has wintered in the central parts of the SIW (Behrouzi Rad 1993; Scott 1995). In 2000–01, however, only 4 individuals were seen (PCE 2002), and after 2001, no reports were received from the wetland. Many other threatened species have also not been recorded in the wetland in recent years. Due to the inadequate management of the SIW, it has been included in the Ramsar Convention's Montreux Record (of wetlands at risk of ecological change) since 1993 (Ramsar website 2010). The Iranian Department of Environment (DOE) imposed the Environment Impact Assessment (EIA) regulation in 1994. Unfortunately, most EIA reports do not included wetland conservation when the final development project decisions are made because the Khuzestan Environmental Conservation Organization (KECO) and the DOE of Iran do not have the expertise and overall capacity for addressing the magnitude of the problem. This lack of enforcement of the EIA regulations handicaps wetlands management efforts (PCE 2002).

Methodology

The contingent valuation of SIW

Given, the purpose of this study was to estimate the non-market values of SIW, it was decided to employ a dichotomous choice CVM approach, to quantify the public preferences and WTP toward wetland conservation through developing an appropriate questionnaire. The first step in this process was to identify the relevant goods and services being valued, based on focus group studies, expert consultations, and literature reviews. Hence, the following services were selected to be included in the CVM scenario: maintenance and preservation of biodiversity and their habitat, preservation of natural sceneries, improvement and preservation of ecological functions, and other attributes related to non-use values of wetland, such as existence value or use value of the wetland for future generations. The payment vehicle was defined as a onetime donation to contribute to the SIW conservation. Donation was preferred over taxation or other payment vehicles to reduce the potential for protest zero responses and to minimize disagreements. Studies in developing countries tend to indicate that people distrust the government. Thus, applying payment methods that involved taxation or increase in the water bill would be rejected by the respondents (Ojeda et al. 2008).

A single, bounded, dichotomous choice was selected as the elicitation format. The advantages of this method compare to other CVM elicitation formats (such as the bidding game) is that it mimics behavior in regular markets, where people purchase a good at certain prices (Bateman et al. 2000). Each survey respondent is given one specified price and asked whether they would be willing to pay the amount stated in each question (Bateman et al. 2000; Hadker et al. 1997; Venkatachalam 2003; Turner et al. 2004). Hence, in the single-bounded format, the respondents' were asked whether they are willing to pay X amount to improve the SIW conservation (and prevent further decline in mentioned resources) with a onetime donation.

The questionnaire designation

A CV questionnaire was conducted to estimate non-market values of SIW. The study focused on the Shadegan town and related villages inside the wetland, Ahvaz in the north, Abadan in the south west, and Mahshahr in the east, which are major population centers around the wetland. Following Mitchell and Carson (1989), Kanninen (1993) and Alberini (1995) in trying to reduce the problem of biases, $V = \sigma$ (coefficient of variation)/(true WTP) was measured. Mitchell and Carson provided guidance on the sample size needed. If $V = 2.0$, with a 90% confidence interval, and a 15% difference between the true and estimated WTP, a sample size of 500 is required (Mitchell and Carson 1989). Therefore, a sample including 526 respondents was selected for this study.

The first pretest survey was conducted through email. Feedback on the questionnaires was obtained in order to find out how realistic the bid amount was and how accurate the questions were from the perspective of Iranian nationals. The actual field pretesting of the survey was conducted in Ahvaz, Shadegan, as well as in some villages around Shadegan in January 2009. A total of 20 questionnaires were filled out during the pretesting field survey. The final version of the questionnaire includes four sections. The first section is introductory and the second section presents the valuation scenario and the WTP questions. The third part asks for information concerning the respondents' attitudes and the fourth section covers the respondents' socioeconomic profile.

The first section, which was the introductory script, was used by the interviewer to identify and initiate contact with a potential survey respondent. The second section included a hypothetical market, where respondents were presented with the information about SIW. This information was supported by photos and a map of the study area. Efforts were made to highlight the features of the wetland. Vital statistics were provided regarding its valuable flora and fauna, ecological functions, and beautiful sceneries. The problems which had caused a significant reduction in the wetland's resources were also described. This scenario was followed by questions on WTP for the conservation value of the SIW. In the single-bounded questions, respondents could easily accept the offered bid amount or reject it. The payment was in the form of a hypothetical donation for the wetland conservation. The budget constraint reminder was included to make respondents answer to this question as realistic as possible. A carefully bid selection has essential importance in these kinds of studies (Ragkos et al. 2006). Using the results from the pretest, 5 sets of bidding price were selected in the range of RLs 10,000–30,000. Each of these bid amounts was randomly assigned to each of the surveys prior to undertaking the interviews.

In the third section, respondents were asked about their attitudes toward environmental policy in general and wetland conservation in particular. The other question in this section was designed to elicit the respondents' reasons for answering "No" to the WTP question. This section was followed by some questions to elicit the respondents' preferences toward the protection of "natural resources" and their views on "management strategies" and the "Shadegan Wetland" with a five-point (Likert) scale: strongly agree, agree, neutral, disagree, or strongly disagree.

The last section of the questionnaire sought to obtain the socioeconomic profile of the respondents. This section included questions about their; age, gender, occupation, education level, family size, income level, residential status, and the distance of the respondent's dwelling from the wetland.

Based on the National Oceanic and Atmospheric Administration (NOAA) panel guidelines (Arrow et al. 1993), a closed-ended format and in-person interviews with well-trained interviewers offered the greatest scope on detailed questions and answers. The decision was made to only include respondents who were at least 18 years old. The stratified random sample was applied in this study. A general problem with random sampling is that one could, by chance, miss out a particular group in the sample. However, if the population is grouped and each group sampled, one can ensure that the sample is representative. With stratified random sampling, the population is first divided into a number of parts or "strata" according to some socioeconomic characteristic. For this survey, the stratification factor was the region where respondents' homes were located, which indicated their standard of living. The survey used three strata: (1) those living in the region with a low income level, (2) Those living in the region with a medium income level, and (3) Those living in the region with a high income level.

The main questionnaire was conducted from January to May 2009. From the total number of completed questionnaires, 26 of them were eliminated because of their refusal to participate or due to incomplete answers to WTP questions. Therefore, the present study was carried out by 500 completed questionnaires, of which 120 were filled out in Abadan city, 120 in Ahvaz, 110 in Mahshahr, 97 in Shadegan town, 18 in the village of Nasseri, 17 in the village of Rogbeh, and 18 in another village called Sarrakhieh (these villages are located inside the wetland). Statistical analysis and the estimation of the logit model were carried out using SPSS (Ver.17) and Excel software.

Willingness to pay estimation

Hanemann (1984) and Cameron (1988) developed two basic methods to estimate willingness to pay gained

through questionnaires. Hanemann applied an indirect utility function to estimate WTP (McConnell 1990). Cameron (1988) offered an alternative method for estimating willingness to pay, using DC data. This method produces separate estimations for the standard deviation of the WTP and explanatory variables of the model. The Cameron's (1988) logistic model is based on the cumulative standard logistic function from which estimations of exponentiation quantities and a confidence intervals for the central tendency measure of WTP is easy and quick, while providing more accuracy (Cameron 1988; Turner et al. 2004).

Cameron's (1988) method produces individual fitted values for WTP and the partial derivative of this value with respect to x for every respondent. The latent continuous dependent variable is the respondent's true WTP for a non-market goods, Y_i ,which is conditional on a vector of explanatory variables such as socioeconomic characteristics x_i, and the mean of $g(x_i, \beta) = x_i'\beta$. The observed variable is the respondent's "yes" or "no" response to agree or reject the offered amount t_i.

Using the standard maximum likelihood function with binary choice yields:

$$Y_i = x_i'\beta + \varepsilon_i \tag{1}$$

If the difference between respondents' true WTP and its conditional expected value $\varepsilon_i = Y_i - x_i\beta$ is greater than the difference $t_i - x_i\beta$ for the WTP questions, let an acceptance of t_i be denoted by $t_i = 1$, and rejection by $t_i = 0$.

$$I_i = 1 \quad \text{if } y_i > t_i \tag{2}$$

$I_i = 0$ otherwise

where t_i is the threshold value. The respondent's true WTP is either greater than or less than t_i.so that:

$$\begin{aligned} P_r(I_i = 1) &= P_r(Y_i > t_i) = P_r\left(\varepsilon_i > t_i - x_i'\beta\right) \\ &= P_r\left(\varepsilon_i/k > \left(t_i - x_i'\beta\right)/k\right) \\ &= 1 - P_r\left(Z_i < \left(t_i - x_i'\beta\right)/k\right) \end{aligned} \tag{3}$$

where ε_i is the error term with cumulative density function that mean is equal to 0 and standard deviation b, and z was used to imply the standard logistic random variable with mean is 0 and standard deviation is equal to $b = \pi/\sqrt{3}$ (Cameron 1988).

Unlike other researchers who assumed t_i (threshold value) is one of the x_i variables, the Cameron's method which includes t_i as a variable separate from x_i, estimates the new "censored logistic model" (Cameron 1988, p. 361). For an independent observation, the maximization of log likelihood is as below:

$$\begin{aligned} \log L = &\sum (1 - I_i)\left[\left(t_i - x_i'\beta\right)/k\right] \\ &- \log\left[1 + \exp\left[\left(t_i - x_i'\beta\right)/k\right]\right] \end{aligned} \tag{4}$$

The estimation of the WTP can then be computed through the following formula:

$$\text{WTP} = (\beta_0/\beta_1) + (\beta_2/\beta_1)\text{inc} + (\beta_3/\beta_1)_{\text{tp}} \tag{5}$$

where β_0 is the constant, β_1 is the coefficient for the BID variable, β_2 is the coefficient for income, and β_3 is the coefficient for the taste and preferences variable for the good under study (Loomis 1990).

Results and discussion

Respondents' socioeconomic profile

The descriptive analysis of the respondents' socioeconomic profile is presented in Table 1. The respondents' were aged between 18–85 years and 57% of them were male. In terms of household size, the respondents' ranged between 2 and 19 members per household. About 25% of them have university degrees. The rest have college (14.2%), high school (30%), secondary school (18.2%), and elementary school (11%) certificates, and 1% never been to school. Most of the respondents (94.8%) did not active in any non-government organizations (NGOs) that are involved in environmental conservation programs. On the occupational aspect, 6% of them were unemployed, 89.2% employed, 3% retired, and 1.8% students. The average income was estimated to be RLs 552,434.77. The average distance of the respondents' homes from the wetland was around 49.97 km, which included rural areas that were surrounded by the wetland (0 km distance away) to cities that were up to 190 km away from the wetland. For the respondents from the Rogbeh and Sarrakhieh villages and Shadegan town, SIW has an important use value to them. While some respondents from the Abadan and Mahshahr cities benefit from direct use value of the wetland, such as fishing and hunting, the respondents from Ahvaz city were classified as pure nonusers of the wetland.

Respondents' attitudes

In terms of attitude information, the results indicated that 34.6% of the respondents believed that environmental policies are very important to them, compared with other polices that the government is concerned with, such as law and order or education. Forty-three percent stated that environmental policies are quite important, 20% indicated they are not very important, and 2% did not care about the issue. When respondents were asked about their familiarity with the environmental issues, the results showed that the majority of them (63.8%) were somehow familiar with environmental issues, while 7.8% were very familiar, 25.6% were not very familiar, and 2.8% assumed

Table 1 Socioeconomic profile of the respondents

Variable	Frequency (%)		Mean	SD
	Number	%		
Age (year)			34.22	10.249
Gender				0.495
Male	286	57.2		
Female	214	42.8		
Education level (years of study)			13.67	4.317
Illiterate	5	1.0		
Elementary school	58	11.6		
Secondary school	91	18.2		
High school	150	30.0		
College	71	14.2		
Graduate or post graduate	125	25.0		
Number of household			5.38	2.209
Membership in NGOs				
Yes	26	5.2		
No	474	94.8		
Employment status				0.238
Currently unemployed	30	6.0		
Currently employed	446	89.2		
Retired	15	3.0		
Student	9	1.8		
Income (rials)			5,357,981.00	242,954.140
Low (<3,000,000)	84	16.8		
Medium (3,100,000–6,400,000)	239	47.8		
High (>6,500,000)	177	35.4		
Residential status				
Urban	447	89.4		
Rural	53	10.6		
Distance to the wetland			49.97	35.355
<10	150	30		
11–50	98	19.6		
51–100	245	49.0		
50<	7	1.4		

themselves not familiar at all with such issues. Out of all of the respondents, 59.6% had visited SIW at least once.

Estimation of mean WTP

To analyze the dichotomous choice CVM, the respondents' answers to the bidding prices were categorized as dummy variables where Yes = 1 and No = 0. Eighty-two percents of the respondents agreed to pay and the rest declined. The frequency of the responses to the bidding price is shown in Table 2. A number of protest bids were recorded. As Table 3 shows, 51% stated that the government should pay for conservation, 6.8% did not know the best choice, while for 6.8%, the question was confusing, 9.5% did not care about SIW, and finally 25.7% despite supporting conservation of SIW did not make an effort to pay the charge.

A bivariate logit model was applied to estimate the regression equation. The logit model predicts the probability of "Yes" responses as a function of the offered bid amount and other explanatory variables. The results of the logit model are shown in Table 4. In order to enrich the best model, only those variables that were statistically significant were included in the final regression model.

The most important explanatory variable is the offered price. In the study, this variable was significant at 1% level and showed the expected negative sign. This means that the probability of saying "yes" to contributing to wetland conservation decreases (increases) as the offered price increases (decreases) under the hypothetical market.

Table 2 Frequency of responses to biding prices

	WTP		Total
	No	Yes	
BID			
1,000	12	88	100
1,500	13	87	100
2,000	14	86	100
2,500	28	72	100
3,000	21	79	100
Total	88	412	500

Table 3 Respondents' reason for not contributing in SIW conservation

Reason	Frequency	Valid percent
I did not know the best choice	5	6.8
Questions were confusing	5	6.8
I don't care about Shadegan Wetland	7	9.5
Government should pay	38	51.2
I can't pay any charge	19	25.7
Total	74	100
Agreed to pay for conservation contribution	426	
Total	500	100

Household income is another important factor influencing the respondents' willingness to pay. This variable was also found to be statistically significant at 1% level and as expected with a positive sign. The positive sign indicates that as income increases, the probability for the "yes" answer to WTP increases as well. The education variable was significant at the 1% level with an expected positive sign. This implies that respondents with higher education had higher willingness to pay. The household size variable (HHSIZE) was significant at the 1% level with a negative sign. This negative sign suggests as the number of member in the household increases the probability of a WTP "yes" significantly decreases. The age variable was statistically significant at the 10% level with a negative sign. The negative sign implies that the probability of a WTP "yes" is higher in younger people than in older people. The gender variable was significant at the 5% level with a negative sign. This suggests that women were more likely to contribute than men. In terms of the respondents' residential status, this variable was significant at the 1% level with a negative sign. This means that the probability of WTP "yes" was higher in respondents from rural areas than those from urban areas. The employment variable was significant at the 1% level with an expected positive sign. This positive sign indicates employees, including currently employed and retired, had more willingness to pay than unemployed.

Table 4 Final willingness to pay model

Variables	B	SE
BID	−.613	.196*
INCOME	.002	.001*
STRATA	−5.15	1.326*
EDU	.137	.039*
HHSIZE	−.195	.073*
GENDER	−.611	.286**
AGE	−.025	.013***
EMPL	1.56	.510*
Constant	5.960	1.801*
−2 Log likelihood = 361.275		
Cox & Snell R Square = .188		
Nagelkerke R Square = .310		
Mean WTP = 16,203.78 RLS		

* Significant at 1%, ** 5% and *** 10% level

The p value of 0.887 computed from the chi-square distribution with 8 degrees of freedom, indicates the logit model is barely a good fit. The results also indicated the explanatory variables have a jointly significant impact on WTP. From Cameron (1988):$\mathrm{WTP}_{\mathrm{overall}} = [\beta_0 + (\beta_{\mathrm{INC}} * \mathrm{INC} + \beta_{\mathrm{STRATA}} * \mathrm{STRATA} + \beta_{\mathrm{EDU}} * \mathrm{EDU} + \beta_{\mathrm{HHSIZE}} * \mathrm{HHSIZE} + \beta_{\mathrm{GENDER}} * \mathrm{GENDER} + \beta_{\mathrm{AGE}} * \mathrm{AGE} + \beta_{\mathrm{EMPL}} * \mathrm{EMPL})]/\beta_{\mathrm{BID}}$The mean WTP computed from this model was RLs 1,6203.78 (US$ 1.74) per household as a onetime donation. Aggregate results were estimated from multiplying individual WTP by the number of households in the study area. In 2009, there were 410,871 households in our study area. Translating the DC-CVM mean WTP to the study area resulted in RLs 6,657,663,242 (US$ 715,877.88) from onetime donations. Assuming a more pessimistic scenario in this study (that nobody would contribute to donating to the Shadegan wetland on an annual basis), the value of the net benefits would be equivalent to the onetime payment. If, however, one assumes a more optimistic scenario (based on what respondents revealed during the survey that they would contribute on an annual basis), then the value people receive from the wetland would be for a 1 year or more time horizon. Therefore, translating this result to an annual base would give RLs 79,891,959,509 (US$ 8,590,535).

Conclusion

Being a developing country with medium to low income and a strong emphasis on development and growth in Iran means that environmental conservation—as one of the three pillars of sustainable development—has not received adequate

attention in terms of decision making or budgetary allocations. Therefore, large areas of land outside the protected areas have become degraded and even those ecologically important protected areas are under extreme pressure.

Given the diversity of social, economic, and environmental benefits arising from the Shadegan International Wetland, there are strong opinions that people, especially those who are living in the area near the wetland, feel that this ecosystem is important to them. Therefore, the present study was conducted with the aim of estimating the economic benefits of the SIW as a very useful instrument for reflecting the values of this unique ecosystem to its society members. Since most of the goods and services provided by this wetland are nonmarketable, single-bounded DC-CVM was employed to estimate the non-market values of the wetland. A hypothetical market was established to derive the respondent's "Yes" or "No" answers regarding their willingness to pay toward wetland conservation through donation. A total of 526 households were interviewed in person using the stratified random sampling method. The findings revealed that 82.4% of the people were interested in paying or contributing through donation. The estimated mean WTP was RLs 16,203.87 (US$ 1.74) per household based on a onetime donation. The results also suggested that demographic variables such as the respondent's age, gender, education, employment, household size, household income, and strata are very important predictors of WTP.

Since natural resources including wetlands are an important part of wealth in each country, the results of this study can provide useful information about goods and services provided by the wetlands and their value to society. In this way, the findings can be used for larger societal awareness about wetlands and wetland-based benefits, including economic benefits. The results of this study could be beneficial to policy makers, authorities such as regional and local managers in order to make better considerations when determining the consequences of present policies on the real value of wetland services. On the other hand, the results of valuation can help to convince the government and other decision makers to allocate more resources for conservation. By identifying and quantifying the major benefits provided by wetlands, the valuation can provide invaluable support to conservation efforts. Therefore, the benefits of the wetlands for society based on the WTP results could encourage managers to set priorities to ensure that the ecosystems' health, integrity, and uniqueness are conserved in a proper manner.

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