

Valuing of the Benefits of Endangered Miangaran Wetland

A. H. Montazer-Hojat¹ and B. Mansoury²

¹Department of Economics, Shahid Chamran University of Ahvaz, Iran
Email: a.hojat@scu.ac.ir (Corresponding Author)

²Department of Statistics, Shahid Chamran University of Ahvaz, Iran
Email: b.mansouri@scu.ac.ir

ABSTRACT

The purpose of this paper is to aid the policy makers and planners in efficient and sustainable management of Miangaran Wetland within the framework of Ramsar Convention. For this purpose, the overall economic value of the wetland was derived in order to provide the policymakers with relevant information. Choice modeling analysis was applied to estimate the annual value of non-market benefits of Miangaran Wetland; and the market prices method, to derive its market benefits value. From the sum of these figures, the total annual value of the Wetland was obtained as 478.5 billion Rials or United States 19.3 million Dollars. In the absence of social discount rate and using the real interest rate of agriculture and natural resources sector, the wetland's value, as a natural capital, was calculated to be 7596.1 billion Rials or United States 307.5 million Dollars. The magnitude of such figures indicates that Miangaran Wetland is very valuable for the society which is prepared to pay to protect it. Therefore, it may be hoped that the society would cooperate with any protection plan of this wetland. Moreover, the results of this study could be used for economic evaluation of projects before execution within the wetland's periphery.

Keywords: Choice modeling, market prices method, valuation, wetland

Mathematics Subject Classification: 62J05

Journal of Economic Literature (JEL) Classification: Q50

1. INTRODUCTION

Ecosystem of a wetland has a variety of elements, functions, and features on which basis scholars identify a wetland (Barbier et al. 1997). In other words, wetlands are a safe haven for living things and a suitable bed for plants growth and provide a variety of ecological services to the surrounding human communities which affect their welfare both directly and indirectly (Mudavanhu et al. 2017). Among the services provided by wetlands, some are offered to markets and priced while others do not find market value due to lack of market. Nonmarket nature of this group of services makes the value of wetlands not being understood properly and being undergone considerable damages in the process of economic growth (Kaffashi et al. 2012). During past decades, attention to economic development and conversion of natural capital into manufactured products has exposed such natural capitals to serious threats (Aaronson et al. 2006). In Iran, too, during a few recent decades, the annihilation speed of natural capitals, especially wetlands, has been highly expedited. Drying out of wetlands has not been unrelated to dust storms; and during the past decade, 244 dust storms of various degrees of intensity have afflicted Khuzestan Province (IRIMO 'Iranian Meteorological Organization', 2016).

Miangaran Wetland (MW) is an important wetland in Khuzestan Province to the northeast of the Province on the submontane areas of Zagros mountain range, adjacent to the ancient city of Izeh

(Fig.1). The Izeh-Shahrekord Road passes through this wetland and presents scenic landscapes to the passengers. The wetland is fed exclusively by precipitation (DOE 2016).

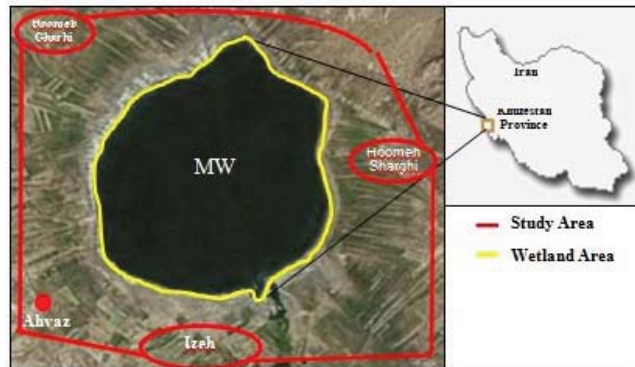


Figure 1. Geographic position of Miangaran wetland and study area

Plant cover of the wetland is diverse; and every year in the migration season, various bird species travel to this area. This wetland has an effective role in feeding of underground waters and supplying drinking and irrigation water; and prevents regional dust storms occurring due to east-west winds. Unfortunately, due to discharging urban and agricultural waste waters, road making, and erection of high voltage towers on the wetland bed, the natural ecosystem of this wetland has been jeopardized and required attention of planners and policymakers. One risk threatening the wild life of this wetland is irregular harvesting of water for irrigation and drinking water supply of residential areas without any economic-environmental evaluation (DOE 2016). Such issues lie in the lack of proper understanding of the MW's economic value and their destruction in the process of economic activities. The economic value of wetlands could be helpful for policymakers when deciding whether use a wetland or protect it in accordance to economic efficiency criteria and facilitate wetland management toward achieving sustainable development. Thus, due to lack of such useful information for MW this wetland is exposed to annihilation. This necessitates a comprehensive study of the economic evaluation of this wetland to persuade policymakers and planners to pay more attention to protecting this wetland.

Total economic value (TEM) of a wetland is obtained from the sum of its use value (UV) and non-use value (NUV) (Pak et al. 2010; Richardson and Loomis 2009; Perman et al. 1995; Adamowicz 1995; Bateman and Longford 1997; Freeman 1993; Peace and Turner 1990; Peterson and Sorg 1987; Randal and Stoll 1983). UV is formed of direct UV (DUV) and indirect UV (IUV); and in some studies, scholars have included option value (OV) in this category as well (Huang and Wang 2015; Pak 2010; Merlo and Briaies 2000). NUV, on the other hand, consists of existent value (EV) which in turn includes vicarious consumption (VC) and stewardship (Mitchell and Carson 1989; Thomas and Callan 2007). UV is obtained from the utility derived from the direct use of goods and services of the wetland while IUV is the utility that an individual derives indirectly from the wetland's goods and services (Huang and Wang 2015; Thomas and Callan 2007). Under the assumption of omitting time in the function of consumer demand, OV could be considered a component of UV (Huang and Wang 2015; Togridou et al. 2006). Freeman (1993) believes that depending on the type of uncertainty an individual is exposed to, OV could be included in UV or even NUV. Plottu and Plottu (2007) believe that because of difference of OV from UV and NUV in nature, they should be considered separately. Estimation of OV leads to more realistic evaluation of TEV. Many studies have estimated TEV for natural ecosystems' services (Loomis et al. 2000; Whitehead 1993; Parumog et al. 2003; Zander 2013; Yang et al. 2008; Cui et al. 2016). However, a few studies have accounted for OV in TEV calculations (Huang and Wang 2015). As far as we know, the present survey is one of a few studies in Iran taking OV into account.

For DUV, usually Direct Market Evaluation such as market price or Substitutions Market Evaluation has been used (Cui et al. 2012). Theoretical foundation for DUV is Revealed Preferences Method (Turner et al. 2010), where one tries to monetarize the utility derived from services of a natural ecosystem (Zhang et al. 2017). In other words, individuals' choices in the real world and when they exchange goods and money are measures and valued. DUV derivation methods are less controversial (Huang and Wang 2015). This study applies market prices method for DUV. In this method, widely used in valuation literature, at first the market value of goods and services provided by a wetland is derived. Further, in case of government intervention in the market, modifications are made in relation to non-competitive market. Eventually, incomes from selling such goods and services are calculated which after subtracting costs incurred by the stakeholders, are considered as the wetland benefits value (Fisher et al. 2011).

Choice Modeling (CM) and Contingent Valuation (CV) are two conventional methods for deriving the people's willingness to pay for non-market benefits (Jie et al. 2016). Since 1980's, the CV method has been broadly used to value ecosystem services. On the other hand, the CM method has been applied to value the elements of a natural ecosystem under quality improvement scenarios (Louviere et al. 2000). One major limitation of CV, however, is the inherent bias within market simulation (e.g. strategic bias, information bias, starting-point bias, hypothetical bias, and observed discrepancy between WTP and WTA).

Such biases lead to concerns about the validity of this method, and as a result, its accuracy, as well as weakening of its reliability and consequently, its consistency (Tietenberg and Lewis 2009; Cui et al. 2016; Venkatachalam 2004). This bias is referred to as part-whole bias (PHB) (Kahneman and Knetsch 1992); and makes the respondents express their bid for a set of goods and services instead of specific goods and/or services which leads to greater WTP derived from CV compared to CM (Boxall 1996).

In fact, as in most cases, CV values ecosystem services as a whole and makes it difficult to derive values for each of the services separately (Jie et al. 2016). In other words, combining many attributes and different levels thereof in the same object makes it difficult for respondents to clearly perceive the relationship between utility and environment.

Some of these issues at least have been solved theoretically in CM. Differentiating an environmental object in terms of its attributes and levels allows the respondents to identify the Marginal value of each attribute, and consequently, to facilitate the comparison of their importance (Jie et al. 2016; Goldberg and Roosen 2007; Hanely et al. 1998). This advantage of CM is very attractive in designing public policies because it enables the policymakers to consider different combinations of attributes and their levels and measure the impact of a certain policy more accurately (Mogas et al. 2005; Christie and Azevedo 2002; Hanely et al. 1998). Thus, given the strengths of CM compared to CV, this study employs CM for IUUV, OV, and NUV. Fig. 2 summarizes the methods applied by this study.

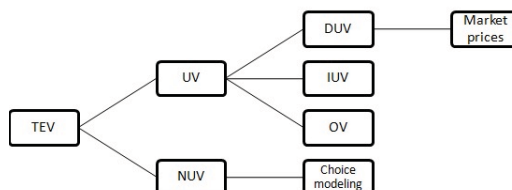


Figure 2. TEV elements and their valuation method

This paper is a result of a study which has been carried out in Khuzestan province to extract the economic value MW in 2015.

The present study tries to derive the economic value of selected goods and services of this wetland which are offered to the market through the methods of market prices. Additionally, by using Choice modeling analysis (CM) method, the economic value of selected nonmarket benefits of this wetland will be estimated. Further, by generalizing the sum of market and non-market benefits value of MW to the overall stockholders population, natural capital flow will be calculated. Thus, necessary information to calculate the share of MW in the GDP of the Province will be provided. As a result of excluding the overall value of MW's nonmarket benefits from the GDP calculations of the Province, first these figure will be added to the GDP of the Province and then, the wetland's share in the GDP will be calculated. Ultimately, in the absence of social discount rate and by using the real interest rate in agriculture and natural resources sector, MW value will be calculated as a natural capital stock.

2. MATERIALS AND METHODS

2.1 Choice modeling design

CM is based on the Rational Behavior Principal. In other words, there is a belief that by observing random choices of any economic individual, their preferences could be derived. Therefore, in this method, the Stochastic Utility Theory (McFadden 1974) is combined with the Theory of Consumer Choice of Quality Attributes (Lancaster 1966) (Kaffashi et al. 2012). In this method, comparing the desirable level of wetland services with the status quo N , the respondents express their willingness to pay for a change from status quo to desired status; and select among multiple scenarios presented by index cards (for instance, the three scenarios N , Z , and T on the same card). If the respondents tend to retain their money, they will not select either Z or T but N . thus, it is assumed that any of the respondents will compare the utility derived from all the three scenarios; and will choose an object which maximizes the utility. In modeling individuals' preferences, the utility of the individual i for the scenario m (U_{im}) is a function of wetland attributes (X_n), protection cost (C_i) and socio-economic traits of respondents (S_i) (Newell and Swallow 2013). Thus, individual utility function is defined:

$$U_{im} = U(X_m, C_m, S_i) = V(X_m, C_m, S_i) + \varepsilon_{im} \quad (1)$$

where,

X_n is a vector of n scenarios (N , Z , and T);

$V(\cdot)$, the non-random component of utility;

ε_{im} , a random component, reflecting the difference between random utility (U_{im}) and a non-random component (V_{im}).

Any of the respondents will compare the three presented scenarios and select the one maximizing the utility:

Maximize U_{im}

So that

$$U(X_m, C_m, S_i) > U(X_j, C_j, S_i), m \neq j \text{ for all } j = \{N, Z, T\} \quad (2)$$

Thus, in general, the probability of selecting object j by an individual i will be:

$$P_i(j) = \Pr[V(X_m, C_m, S_i) + \varepsilon_{ij} > V(X_m, C_m, S_i) + \varepsilon_{im} \text{ for all } j \neq m, j = \{N, Z, T\}] \quad (3)$$

where,

$\Pr(\cdot)$ is the stochastic operator. It is assumed that distortion terms ϵ are distributed independently and uniformly so that $\text{Pi}(j)$ in Eq.(3) will be a logistic function.

This study applies Random Parameter Logit model (RPL), an augmented Multi-nominal Logit model. The advantage of RPL is that it is not constrained to the Independence of Irrelevant Alternatives Assumption (IIAA); and is capable of estimating the heterogeneity unobserved among individual preferences. Thus, the random utility function is modeled:

$$U_{im} = \beta_x X_m + \beta_c C + \beta_s S_i$$

(4) Coefficients in this model are estimates using maximum likelihood method; and if $U(\cdot)$ is linear, the coefficients β_x and β_c will represent marginal utility of the attribute X and money, respectively. Marginal willingness to pay (MWTP) is obtained through dividing price coefficient by the coefficient of each attribute:

$$MWTP = \beta_x / \beta_c \quad (5)$$

Previous research (Kaffashi et al. 2012; Newell and Swallow 2013), comments from faculty members and experts in the Organization for Environmental Protection were reviewed to identify non-market attributes of the wetland. Selected attributes included natural delightful landscape, biodiversity preservation (emphasizing endangered species), and wetland ecologic performance.

Table 1: Selected attributes and levels for MW

Attributes	Levels
Natural scenery: the part of the natural landscape that continues to be pristine.	Not satisfactory less satisfactory satisfactory
Ecological function: that part of the wetland function that is independent of human intervention, such as nutrient cycling, flood prevention, dust control, moisture and temperature regulation, maintaining the flow of underground aquifers and pollution reduction.	Weak Average Strong
Conservation of biological diversity: Wetlands as a safe haven for living organisms, such as plants, animals and aquatic animals.	Not acceptable Somewhat acceptable acceptable
Conservation value (cv)	0 \$ 2.02 \$ 3.64 \$

Further, three levels were considered for each attribute. The first level, or the base level, represented the wetland services quality status quo; and the next two levels, the medium and high levels of wetland quality services relative to the status quo and after the execution of wetland protection plans. Since the aim of this study is to calculate the changes in people's welfare, a monetary option was also asked of them as the last question. This monetary value was calculated based on entrance fee of national parks in Iran and consultation with Iran's Organization for Environmental Protection experts. Prices used in this study were determined at 50,000 and 90,000 Rials, or USD 2.02 and 3.64, respectively¹.

Five cards were designed for CM purposes. Using Fractional factorial method, and omitting improbable states in SPLUS software environment, ten different states were selected between three wetland attributes and its protection costs. Improbable states are those in which a low wetland attribute level is placed in the same option along with a very high protection cost; or a high attribute level with a very low protection cost. Further, the ten states obtained were assigned to 5 index cards with two scenarios Z and T, as well as a basic scenario N. Cards were sent for comment to a number

¹ The rate of each US dollar is 24700 Rials.

of scholars, were improved accordingly, and were distributed among a number of respondents selected randomly for transparency and comprehensibility testing; and were finalized examining the collected cards and using the comments from environmental experts. An example of the cards is shown in Table 2.

Therefore, the respondents reveal their willingness to pay through changes in wetland attributes.

Table 2: A typical index card

	Scenario N	scenario Z	scenario T
Natural Landscape	Bad	Good	Good
Biodiversity	Weak	Average	Weak
Ecological performance	Weak	Good	Average
Educational performance	Weak	Average	Average
Monetary value of conserving wetland services(\$)	0	2.02	3.64

3.2 Market price method

The first step in market prices method is identifying a portion of wetland goods and services directly used by its periphery inhabitants. For this purpose, and based on field observations, consulting with experts from General Office for Environmental Protection and faculty members, and using previous research, direct use benefits of MW were identified which were: fishing, agriculture, animal husbandry, mat weaving, and medicinal plants use. A major portion of wetland periphery inhabitants are occupied by agricultural and animal husbandry activities, using their products for personal consumption as well as selling in the market. Due to insignificant use of medicinal plants and wetland bed canes for mat weaving, these two items were not included in direct benefits calculations. Additionally, due to lack of recreation and lodging functions in the area, MW does not receive tourists. Therefore, benefits from this service have also been excluded.

A fragment of wetland bed lands is used by inhabitants for agriculture which is considered among direct services of the wetland. Additionally, job creation was considered as a special benefit of the wetland, that is, employment created by the wetland comes with a lower cost than other sectors of national economy.

3.3 Data collection cm required data

To derive IUUV, indirect users of the wetland ought to be identified. Indirect use of wetland services includes the use of its diverse services such as natural landscape. However, the utility derived from this use is not as tangible to the user as direct use (e.g., fishing) (Thomas and Callan 2007). Therefore, in this study, those consumers who enjoyed the three selected non-market services of the wetland (natural delightful landscape, biodiversity, and ecologic services) were included in the study. On this basis, villages and settlements within 5 Km radius of the wetland were randomly sampled (n=60) which indirectly benefitted from non-market wetland services.

In order to estimate OV and NUV values, a sample of 150 individuals from the population in question, that is, the population of Ahvaz (51 individuals) and Izeh (99 individuals) townships was used. In any of those townships, the stratified sampling method was employed; and subjects were divided into a number of strata based on their socioeconomic attribute. As the respondents did not disclose their income, their residential area was used as a proxy to determine the individuals' standard quality of life and stratum factor. Thereafter, simple random sampling was applied within each stratum. It should be noted that since all the respondents from Izeh Township has already visited the wetland, and exploited its non-market benefits, their information was used to derive IUUV along with the previous 60 questionnaires.

The data collected in Ahvaz were used to derive OV and NUV. From 51 questionnaires filled in Ahvaz, 18 individuals planned to visit and benefit from the Wetland in future. Willingness to pay in this group of people is due to the future exploitation of wetland benefits. Therefore, OV was estimates using the information from this portion of Khuzestan Province population. The remaining sample respondents did not have any plans to visit and benefit from the Wetland in the future; and were willing to pay only to conserve this wetland as a natural capital. NUV has been estimated using the information from this portion of Khuzestan Province population.

According to the statistics sixty percent of Khuzestan Province inhabitants who had not seen and benefitted from the Wetland, had plans to visit and benefit from it in the future.

However, a part of OV and NUV is created by the inhabitants of other provinces. In other words, a portion of other provinces populations who has not seen the Wetland and enjoyed its non-market benefits might have plans to visit and enjoy the benefits in the future, and vice versa. Thus, it was necessary to identify the population of this group of people in other provinces. For this purpose, telephone survey was applied. The procedure was such that firstly eight largest townships (Shahrekord, Booshehr, Hamedan, Shiraz, Isfahan, Tabriz, and Mashhad) in different distances from the Wetland were selected randomly along with Tehran. Later, using systematic sampling, telephone numbers of some subscribers were randomly selected: 30 subscribers from each township, and 60 from Tehran, given the importance and extent of this township. Selected subscribers were contacted in different time intervals (morning, noon, night). In cases of irresponsiveness, other subscribers were replaced randomly. In every contact, a brief description of the project's research nature was provided at first; and the individuals' trust in terms of personal information protection was attracted. Then, personal data such as age, educational level, gender, and ... were asked. At this stage, it was determined whether the respondent had seen the Wetland or not. If no, they were asked whether they had any plans to visit the Wetland and enjoy its benefits in the future.

Using the results of 2015 census, the population residing outside the province was calculated. Next, the share of individuals inclined to visit and enjoy the benefits of the Wetland in the future in each area was determined; and considering the population of each area and its share, the number of OV and NUV stakeholders outside the Province was obtained. The collected statistics indicated that only 16 percent of inhabitants outside the Province had plans to visit and benefit from the Wetland in the future.

3.3 Data required in market prices method

Separate questionnaires were designed for any of MW direct use benefits. Those questionnaires had two sections. In the first, questions were asked on the socioeconomic characteristics of respondents and the distance between their residence and the Wetland. In the second, market prices method-related questions were asked.

Table 3: Sample size by agricultural and animal husbandry activities in selected townships and rural districts

City	Village	Sample size	
		Agriculture	Animal husbandry
Izeh	Hoomeh Sharghy	30	30
	Hoomeh Gharby	30	30
Total		60	60

Data collection was performed in 2015. For this purpose, by designing stratified sampling operations in every district and village surrounding the Wetland, sample size was determined. Questionnaires were completed in two rural districts of eastern and western peripheries. Additionally, an identification instrument was compiled for each village; and data for the number of occupants of each activity were

collected. Table 3 reports the selected townships and rural districts as well as the number of samples by their field of activity in 2015.

4. RESULTS AND DISCUSSION

In order to enhance the results accuracy, two models were estimated by data type: one for indirect users (first group); and one for OV and NUV derivation (second group). Of course, when generalizing the second model results to the entire society, OV and NUV have been differentiated. Using two models for two groups would lead to more accurate and more reliable results (Jie et al. 2016). The model used in this investigation is the Random Parameters Logit (RPL) model the coefficients of which have been estimated using the maximum likelihood method in Stata Ver. 12 software. Reason for using the RPL model has been the heterogeneity in respondents' preferences. This model controls the unobserved and unconditional heterogeneities well (Birol et al. 2006). Table 4 illustrates the results of RPL model in both basic and interaction terms modes for the above two groups.

As seen in RPL model results, coefficients for A2 and A3 variables (natural landscape improvement at level 2 and 3) has been significant for both groups; but bear the expected sign only for the second group. Coefficients for B2 and B3 variables (ecological performance improvement at level 2 and 3) had the expected signs for both groups but B3 in the second group; and are statistically significant except for B2 in the same group. Coefficients of C2 and C3 variables (biodiversity improvement with emphasizing on endangered species in at level 2 and 3) have the expected signs for both groups. Of course, only these two variables are statistically significant for the first group. The coefficient of the wetland conservation cost variable (CV) is statistically significant and has the expected sign. The negative sign of this coefficient indicates that by increasing the conservation costs, probably the individuals' participation is reduced which could be due to decreased utility. Additionally, the expected sign is positive for every coefficient of wetland attributes which indicates that by improving such attributes, the individual utility would increase.

Table 4: Basic and interaction RPL models estimation results

Attributes	Group 1		Group 2	
	Basic model	RPL with interaction	Basic Model	RPL with interaction
A2	-2.7208***	0.4982***	0.7354***	0.3345*
A3	-2.3285***	1.0115***	0.2903*	0.8587***
B2	0.4360*	0.3734*	0.1649	0.2461
B3	-2.8221***	0.5625**	-0.4331**	0.2834
C2	0.7108*	0.0126*	0.0762	0.0158*
C3	0.4500*	0.3077*	0.2113	0.6309**
B3A	-	-0.0505*	-	-0.0591**
C2D	-	-0.0101***	-	-0.0143***
A3F	-	-	-	0.7150*
B2E	-	-	-	0.0551*
CV	-0.00079***	-0.00019***	-0.00013***	-0.00051***
Log likelihood	-731.024	-602.48	-744.157	-708.79
Likelihood ratio	60.57***	20.49**	27.77***	65.00***

*, **, and ***, represent significance at 10%, 5% and 1% levels, respectively.

In order to improve the results, the socioeconomic attributes of individuals were used in the model. Introducing socioeconomic attributes would enhance the accuracy of selection models (McConnell and Tseng 2000; Rolf et al. 2000; Kaffashi et al. 2012).

These attributes are the same in the process of selecting individuals among various card scenarios; and in this study, they include age, distance between residence and Wetland, educational level and

gender. All these variables, except for gender, are continuous variables. Using these attributes and three levels of wetland attributes, four interaction variables were introduced to the model. Moreover, the status quo scenario has been considered as basic level in all models.

As it is seen, the model with interaction variables for both groups is superior to the basic model; and this superiority is apparent due to smaller likelihood log. By introducing interaction variables to the basic model, the likelihood log for both groups has reduced from -731.024 to -602.48 and -744.157 to -708.790, respectively. Furthermore, based on likelihood ratio model, the hypothesis of all coefficients being zero simultaneously is rejected at 1% level; and the model has a sufficient validity. In terms of coefficients significance and their signs, too, the interaction model is superior to the basic model. All the coefficients of wetland attributes including natural landscape, ecological performance, and biodiversity conservation, have positive signs indicating that improvements in any of wetland attributes would increase the respondent utility compared to basic state. Additionally, all these variables are statistically significant at 1, 5, and 10% levels, except for ecological performance in the second group that is significant at 10% level. Price variable is significant at 1% level and has a negative sign indicating that respondents preferred to participate in those conservation plans which do not require extra costs. Thus, the payment coefficient sign is negative indicating its negative effect on individual utility (Kaffashi et al. 2012).

Interaction variable made of age and ecological performance B3A at level 3 is significant and with negative sign for both groups. A negative sign means that aged individuals had lower concerns with wetland conservation. The interaction variable made of level 2 biodiversity conservation and residence to wetland distance C2B is significant and with negative sign for both groups. This means that as an individual's residence becomes more distant from the wetland, the lower their concerns to preserve the wetland become. Gender variable in interaction with level 3 natural landscape A3F is significant only for the second group. The positive sign of this variable indicates that the delightful natural landscape of the wetland is more important for women. The interaction variable made of the individual's educational level and second level of biodiversity is significant only for the second group and has a positive sign. The positive sign of this variable indicates that as the individuals' education levels elevate, their inclination and willingness to protect the wetland is increased. In other words, the utility resulting from wetland protection is higher for more educated individuals.

Using Table 4 results, the marginal willingness to pay was derived from dividing wetland attributes coefficients by cost coefficient in the interaction variables model. Results are as depicted in Table 5.

Table 5: Marginal willingness to pay (USD)

Attribute	Group 1	Group 2
A2	0.1	0.02
A3	0.215	0.07
B2	0.08	Insignificant
B3	0.12	Insignificant
C2	0.002	0.001
C3	0.06	0.05

The marginal willingness to pay represents the exchange between money and wetland attributes assuming that other conditions are constant. In other words, it represents the marginal rate of substitution between wetland attributes and cost variable. For example, if the wetland's natural landscape is improved from unacceptable conditions to a less satisfactory condition (A2), willingness to pay in the first and second groups will be 0.1 and 0.02 USD per month, respectively (1.2 and 0.23 USD annually). The highest willingness to pay is associated with the satisfactory level of natural landscape A3 for the first group. For this wetland attribute, any individual in the first group is willing to pay an average of 0.215 USD per month or 2.58 USD per year. Figures obtained for marginal willingness to pay in Table 5 represent average willingness to pay for any of sample subjects. Therefore, in order to calculate the total annual economic value for the wetland, the figures obtained

for willingness to pay were generalized to the entire population. For this purpose, total marginal willingness to pay (at level 3) was derived for all the three wetland attributes and multiplied by the number of stakeholders of every service. Then, results were reported in Table 6.

Table 6: Annual IUV, OV, and NUV (USD)

	WTP	Number of stockholders	Total
IUV	0.33	381042	125744
OV	0.06	11298871	677932
NUV	0.06	59319078	3559144

In order to derive the total annual DUV, firstly, the price per ton for various crops of the lands surrounding the wetland and animal products were calculated which included the self-consumption portion as well. It is noteworthy that in this region, no taxes or subsidies have been imposed on crops and animal products; and due to the production by private sector and pricing through market mechanism, the state has no intervention in the pricing system of such products. Consequently, no modification was made in the prices obtained from produce market; and the stakeholders' income was calculated multiplying the price by the produce volume. Eventually, the expenses made by individuals (including inputs and labor) were subtracted from the figure obtained and the subtrahend was considered as the wetland benefits value.

Regarding that portion of wetland farming parcels at the disposal of wetland periphery inhabitants, firstly, the total area of such parcels was obtained by urban districts and townships. Then, the obtained figures were multiplied by the annual rentals of the parcels and their sum was obtained which in turn was generalized to the overall statistical population (all the urban districts around the Wetland). Results are as illustrated in Table 7.

Table 7: Annual direct benefits by activity type

Activity	Total Value (USD)
Animal husbandry	2796049
Agriculture	501439
Land	10486275
Total	192018

In order to calculate the Wetland's job creation value, at first, the ratios of practitioners in the sectors of agriculture, industry, and service to the overall number of practitioners was derived using the statistical yearbook of Khuzestan Province. Then, the number of jobs created by the Wetland was multiplied by each ratio. Obtained figures indicate how many the average number of practitioners in each sector would be if the overall employment created by the Wetland had been created in other sectors (industry, agriculture, and service). Now, using the information on creating any job in the aforesaid three sectors in Iran, calculated and presented by the Investigations Center of the Islamic Council Assembly on annual basis, the value of the employment created by the Wetland was calculated. Results are as shown in Table 8.

Table 8: Number of jobs created and its value by various sectors

Sector	Share of each sector in province employment	Number of job created by wetland in each sector	Annual value of job created by wetland (USD)
Agriculture	47%	3747	48877957
Industry	7%	558	24265652
Services	46%	3667	63784000
Total	100%	7973	136927609

Source: research calculations

From the sum of the figures obtained for agriculture, animal husbandry, job creation, and farming parcels, the annual value of the direct use benefits was calculated by USD. Results are as illustrated in Table 9.

Table 9: Annual DUV

	Value (USD)
Animal Husbandry	2796049
Agriculture	501439
Value of jobs created by wetland	8449736
Annual rent of the land occupied by local inhabitant	2490434
Annual value of wetland's benefits	14435200

From the sum of figures obtained for DUV, IUV, and OV, the annual value of UV was calculated as 378.7 billion Rials or USD 15 M. From the sum of UV and NUV, the annual value for the entire Wetland was calculated to be 478.5 billion Rials or USD 19.3 M. Therefore, given the 2,400- hectare area of the Wetland the annual rental for each hectare of the Wetland was obtained as 1,993 million Rials or USD 80,000. The figure obtained for rental per hectare could be used as a basis for fining those practicing on the Wetland bed. Also, those figures could be used for cost-benefit analysis.

In order to calculate the share of benefits created by MW in GDP of Khuzestan Province, at first, the value of annual benefits of the Wetland (except for DUV) was added to the GDP of the Province (Only the DUV has been accounted for in the GDP of the Province because direct use services have a market value and have been accounted for in national accounting). Next, the figure obtained for the Wetland's total annual value was divided by the previous figure. The Wetland's share in provincial GDP was 0.55 percent.

In order to calculate the Wetland's capital value, compound interest was used for Uniform-series present worth factor (Eq.6). Calculating the present value of Wetland services for long-term would enable a cost-benefit analysis which could be applied to the economic evaluation of the projects executed within the Wetland peripheries.

$$P = \frac{A}{i} \quad (6)$$

where,

P : present value;

A : total annual value of the Wetland; and

i : social discount rate.

Due to the lack of social discount rate, the real interest rate in the agriculture and natural resources sector was used as a replacement. In order to derive the real interest rate in this sector, the average long term deposit interest reported by Bank Keshavarzi (Bank of Agriculture)(20%) minus mean inflation rate in this sector (13.7%) was used. This rate was calculated as 6.3% for 2015. Therefore, the capital value of MW, considering the real interest rate of 6.3% was calculated as 7,596.1 billion Rials, or USD 307.5 M.

Dividing the above figures by the Wetland area (2,400 hectares), the value per hectare of the Wetland was achieved as 3.1 billion Rials, or USD 128,000.

5. CONCLUSION

The present investigation tried to answer the essential question what the MW's economic benefits are. Results showed that the figure obtained for the Wetland's benefits is considerable. This proves

the very high value of this wetland for the society; and subsequently, indicates its cooperation with any plan and policy to protect the Wetland.

One problem for Khuzestan Province today, is the fine particles issue. Many experts believe that part of this phenomenon is due to the desiccation of part of wetland beds as a result of poor management. The present study tried to value various services provided by MW; and perhaps the magnitude of the obtained figures could attract the attention of planners to protect this wetland to prevent the fine particles phenomenon from becoming more serious.

Results of this study indicate the share of this wetland in overall province GDP. The value created by MW is not compensated by any budget allocated by the state to protect it. Thus, the results from this study might be used as a measure for financing conservation of this wetland if its services are to be constantly provided.

Today, one major need in national scale is economic evaluation and cost-benefit analysis before executing public plans and policies. Many projects on the bed of MW are performed without economic evaluation which is due to lack of economic value of MW. Results of this study provide the policy makers and planners with necessary information for such analyses. That is, the figures obtained from this study could be introduced to project evaluations as revenues or costs.

Finally, it is recommended that more educational programs be performed through the media and results of this study be used to elevate public awareness as to the economic value of MW.

ACKNOWLEDGEMENT

Here are some thanks to everyone who helped us collect data.

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