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Estimating the recreational values of forest park using the contingent valuation method (case study: Kabudval Forest Park, Golestan Province of Iran)

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Abstract: Forest parks are the main tourism sources in Iran. Growing population, traditional patterns changing, urban environmental contamination and emergent need of leisure times highlighted the importance of this issue. This study aimed to estimate the willingness to pay (WTP) and non-market values of Kabudval Forest Park of Golestan province. For this purpose, the contingent valuation (CV) method based on the maximum likelihood logit regression model was used. The required data were obtained from 152 visitors to the park that were randomly selected in different seasons. Results indicated that the average of WTP for each individual to protect the park was calculated to be 34,850 Rials. Also, considering the total area of the park to be 109 hectares and 400,000 annual visitors, the recreational value of each hectare has been obtained 12,787,400 Rials annually. Also, the elasticities of income, education, age, and household size variables showed a significant effect on the WTP for the recreational use of the aforementioned study area. The location of the Negarestan storage dam and the Kabudval full moss waterfall in this park has increased the attractiveness of this park compared to other forest parks.

Keywords: Logit model; recreational value; forest ecosystems; willingness to pay

Forest ecosystems provide various services and economic values that benefit humankind. These values can be classified into direct use, indirect use, option and non-use values (Mansouri et al. 2014). The direct use values of forest area include the consumptive and non-consumptive uses, e.g. food, fibre, timber and fuel provision, and recreational uses. The forest area ecological services such as improving air quality, mitigating climate change, carbon sequestration, flood protection and so on constitute the indirect use values (Pearce 2001). The option values indicate willingness to pay to maintain a forest park for its probable uses in the future. Non-use values reflect willingness to pay to preserve the forest park, as regards the willingness to pay irrelevant to the current uses. Therefore, the recreational value is a subset of direct values of forest ecosystems and parks, including the forest uses for recreation, leisure, hiking, etc. (Mansouri et al. 2014). Nowadays, the topic of environmental economics has been generally accepted and states that economics and the environment are inseparable from each other, when any change in one of them directly affects the other. In other words, neither economic decisions are made without affecting the environment, nor environmental changes occur without affecting the economy (Costanza et al. 1997; Hein et al. 2006; Dehghani et al. 2010). Appropriate management of forest parks and recreational facilities of a region has a leading impact on the regional economy. As the majority of the world population live in cities, the services pro-

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vided by forest ecosystems have caused an increasing interaction between tourists and nature in the world (Orams 2002), and policymakers' protection and conservation of natural ecosystems to achieve sustainable development are also increasing (Ross, Wall 1999).

The common problem in most environmental issues for policymakers is the gap between the supply of scientific information and the demand for environmental goods (Mcnie 2007). Since most of the forest park values are not tradable in the market, their value is not straightly specified. In other words, environmental resources especially forest parks directly affect human welfare, but the effects of these benefits are not transmitted through price and market mechanisms so they should be valued outside the monetary system (D'alpaos 2012). This issue makes it difficult to assess the value of parks because as planners strive to maximize social welfare, they should be able to determine the level what benefits of creating a park will outweigh the costs (Pirikiya et al. 2016). Therefore, decision-makers by planning the management, costs, and benefits of forest parks, tried to maximize their benefits (Livesley et al. 2016). Since ecotourism resources are usually non-tradable, therefore non-market valuation methods are used to estimate their economic values (Upneja et al. 2001). Hence, multifarious techniques have been proposed. A review of various studies in estimating the Recreational Value of forest areas and national parks shows that the Travel Cost (TC) method and Contingent Valuation (CV) method are commonly used. For the Travel Cost method, if during the trip a visitor has more than one decision to use the trip, the value of the recreational place is overestimated, which can be problematic for the allocation of travel costs among the various purposes (Costanza et al. 1997). So, in this study, the contingent valuation method (CVM) was applied to determine the recreational value of Kabudval forest park. The CVM is the most prominent and widely used method in determining the used and non-used values of natural resource e.g. forests, wetlands, rivers, forest parks, and watershed. Several studies have been conducted to evaluate the environmental commodities and services using the contingent valuation technique in Iran and worldwide (Amirnejad et al. 2005; Asafu-Adjaye , Tapsuwan 2008; Bani Asadi et al. 2011; Dehghani et al. 2010; Latinopoulos et al. 2016; Majumdar et al. 2011; Mansouri et al. 2014; Musa et al. 2015; Pirikiya et al. 2016; Robles-Zavala , Chang Reynoso 2018; Sayade, Rafee 2015; Smaeili, Ghazali 2009; Tuan et al. 2014; Tyrväinen, Väänänen 1998; Upneja et al. 2001). The purpose of the present study is to estimate the recreational value of Kabudval Forest Park of Iran using the contingent valuation method and also the willingness of individuals to pay for this park in 2017.

MATERIAL AND METHODS

Study area

Kabudval Forest Park is the most important tourist attraction of Ali Abad Katul city (Fig. 1). It covers an area of 109 ha and attracts yearly about 400 thousand tourists. The aforesaid park is one of the unique forest parks of Golestan province due to the presence of Kabudval waterfall as the only moss waterfall in Iran and also Negarestan Reservoir Dam.

Sampling method

The required data were collected by questionnaires and face-to-face interviews with 152 visitors. The sample size was obtained by Cochran's formula, questionnaires were collected at different times of the day within 2 months in 1 396 (Iranian Solar year) (2017).

Contingent valuation method

The contingent valuation method (CVM) is a simple and flexible technique which is carried out based on a questionnaire that measures the people's willingness to pay for environmental goods under an assumed market scenario (Hanemann 1994; Lee 1997; Bateman et al. 2002). This technique was introduced by Ciriacy-Wantrup (1947) and for the first time it was used by Davis (1963). In CVM, demand for recreational places is determined by the yearly number of visits to a park and other factors such as types of travel costs, visitor income, and socio-economic characteristics. In this method, a questionnaire is used to reveal individual preferences to make use or preserving non-traded goods via contingent markets in scientific and research paths. To obtain the recreational

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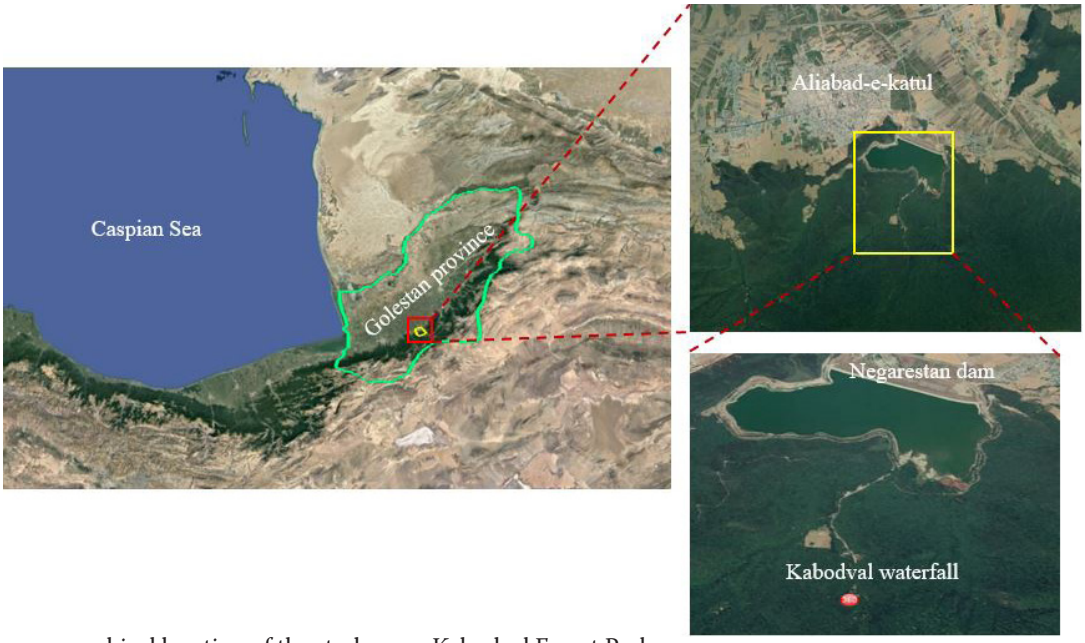

Fig 1. The geographical location of the study area: Kabudval Forest Park

value of forest park, firstly, the target community that is affected by the presence or absence of the forest park is determined. Then, a sample based on the community is chosen and the questionnaire is designed. Finally, data is collected from the sample (Mitchell, Carson 2013). Various steps must be taken to perform the CVM. The first step is informing the respondents about environmental goods and subject matter. In this step, the environmental goods must be described accurately so respondents are aware of their characteristics. In the second step, an assumed market is created so that the respondents can feel they can buy non-market goods. In the third step, the proper payment method is presented so that the respondent knows how to show their willingness to pay (Tkac 2002). The prevalent payment method used in CVM includes entrance fee, tax and donation to a certain institute (Abedini et al. 2016). The fourth step is related to obtaining a bid of maximum WTP by the respondent, then based on the average amount WTP is estimated. The continuous method and discrete method are two WTP extracting methods used in CVM. In the continuous method, respondent's WTP takes continuous figures and e.g. open-ended payment card and suggestion game methods are included. For the discrete method that includes the dichotomous choice, multiple choice and multidimensional choice, a price is offered to the respondent and he is asked to reply a positive or negative answer to the suggested offer (Tkac 2002).

Various surveys showed that the amount of WTP for public goods estimated in the discrete extraction method was higher than in the continuous method (Kriström 1993; Mcfadden 1994; Brown et al. 1996). Also based on the results of Kealy, Turner (1993) and Kriström (1993) studies the expressed WTP in the dichotomous choice method was greater than in the open-ended method.

After the extraction method was chosen, in the next step the factors affecting bid acceptance and WTP rates were surveyed, finally, in the last step data aggregation was done considering the average bid for the total population (Amirnejad et al. 2005).

The estimation was conducted using face-to-face interviews and completing 152 double-bounded dichotomous choice questionnaires (DDC). This method requires the selection of a further bid than the preliminary bid. The further bid depends on the yes or no answer or reaction of the respondent to the initial offer (Marta-Pedroso et al. 2007). Sampling was randomly selected from the community of visitors to the park. The questionnaire consisted of three sections; the first was about the respondent personal information and socio-economic status (including age, gender, household size, occupation, education, number of visits to forest parks, rating of the park, Membership in the Environment Agency or affiliated organizations, household income and expenditures). The second section related to attitude questions or environmental tendencies, ultimately, the last section dealt

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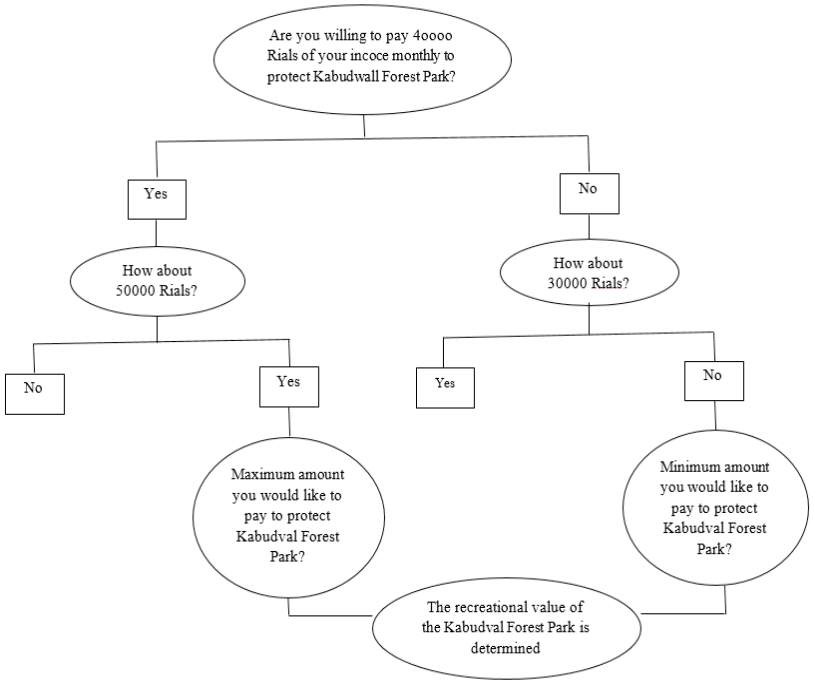

Fig 2. The visitors' willingness to pay flowchart

with contingent valuation and visitors' willingness to pay. In this section, the three bids of 30,000 Rials, 40,000 Rials and, 50,000 Rials were presented as three interrelated questions.

In the first question, we have proposed a mid-price of 40000 Rials. The respondent was asked: "Are you willing to pay 40,000 Rials of your income as an entrance fee to protect Kabudval Forest Park?" because Kabudval forest park supplies you a place for recreation and leisure. If the answer was "Yes", then 50,000 Rials were offered and if "No", 30,000 Rials were offered. Respondents could also choose an amount below 30,000 Rials and above 50,000 Rials in the form of the question "What is the minimum and maximum amount you would like to pay to protect Kabudval Forest Park?". Fig. 2 shows a flowchart of the visitors' willingness to pay.

The dependent variable for determining the Recreational Value is the probability of accepting the entrance offered price, which is obtained by maximizing the respondent utility in answering the above questions (Asafu-Adjaye , Tapsuwan 2008). Mathematically:

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

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

where:

U – indirect utility that a visitor obtains,

Y, A – individual income and the offered price,

S – defined as the other socio-economic characteristics that are affected by the individuals' taste,

$\varepsilon_0, \varepsilon_1$ – zero mean random variables with normal distribution (KIM et al. 2007).

U (1) describes the utility that is gained when a person uses the forest park and U (0) is its reverse mode, and this difference of utility (ΔU) is shown by Equations (3) and (4):

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

$$\Delta U = a + \beta A + \gamma Y + \theta S \quad (4)$$

where:

$\alpha, \beta, \gamma, \theta$ – estimated coefficients with the expected sign,

U – indirect utility that a visitor obtains,

Y, A – individual income and the offered price,

S – defined as the other socio-economic characteristics that are affected by the individuals' taste,

$\varepsilon_0, \varepsilon_1$ – zero mean random variables with normal distribution (KIM et al. 2007).

Generally, Logit, Probit, and Tobit models are used to investigate regressions with binary dependent variables. In this study, the Logit model was used to investigate the effect of explanatory variables on the dependent variable because it is simple and it was used repeatedly in previous studies. Based on the Logit model, the probability (P_i) that

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the respondent accepts an individual choice (A) is as follows:

$$P_i = F_\eta(\Delta U) = \frac{1}{1 + exp\,(-\Delta U)} = \frac{1}{1 + exp\,\{-(\alpha + \beta A + \gamma Y + \theta S)} \quad (5)$$

where:

$F\eta\ (\Delta U)$ – cumulative distribution function,

$\alpha, \beta, \gamma, \theta$ – estimated coefficients with the expected sign of $\beta \leq 0$, $\theta > 0$ and $\gamma > 0$.

The parameters of the Logit model are estimated using the Maximum Likelihood method. There are three ways to calculate the average WTP (Eq. 6-8):

$$E(WTP) = \int_0^{+\infty} F_\eta(\Delta U)dA \quad (6)$$

$$E(WTP) = \int_{-\infty}^{+\infty} F_\eta(\Delta U)dA \quad (7)$$

$$E(WTP) = \int_{min\,A}^{max\,A} F_\eta(\Delta U)dA \quad (8)$$

Of these, the third is the best method because this method has stability, consistency with theory and is statistically efficient (White, Lovett 1999). Ultimately, the expected WTP is estimated as follows:

$$E(WTP) = \int_{\min A}^{max\,A} F_\eta(\Delta U)dA = \int_{\min A}^{maxA} [\frac{1}{1 + exp\{-(\alpha^* + \beta A)\}}]dA \quad (9)$$

$$\alpha^* = (\alpha + \gamma Y + \theta S) \quad (10)$$

where:

E (WTP) – expected amount of willingness to pay,

α^* – adjusted intercept through the socio-economic term added to the main intercept.

In this study MS Excel, Stata, and Maple software were used for mathematical calculations and data analysis.

RESULTS AND DISCUSSION

After completing the questionnaires and extracting data from them, the Recreational Value of Kabudval Forest Park was estimated. Out of 152 respondents who participated in this survey, 108 (71%) and 44 (29%) were males and females, respectively. Only 4 (2.6%) respondents were members of the environmental organization or environmental support organizations. Some important socio-economic parameters of the respondents are shown in Table 1. In this table, variables such as age, size of household, education, the average of respondent's monthly income, the average of respondent's other family members monthly income, the average of respondent's monthly cost, park quality (choosing a number between 0-20) are given by mean, standard deviation, mode, median, maximum and minimum statistics in Table 1 to Table 4.

Table 2 shows the respondent's level of education. 48.1% of visitors have associated-degree education and higher. The respondent's occupational status distribution is shown in Table 3. 55.2% of visitors are employees and self-employed. The results indicated that the visitor's income is the leading factor for visiting the forest areas. Table 4 shows the statistical distribution of Kabudval forest park quality from the visitors' point of view, and reveals that 85.52% of visitors have scored the park quality from 16 to 20, which means that visitors are satisfied with the park quality for their recreational requirements.

As can be seen in Table 5, for the bid of 40,000 Rials (entrance fee), 96 people answered "Yes" and 56 people answered "No". Out of the 96 respondents

Table 1. Descriptive statistics of socio-economic features and affective variables in WTP

variables	Mean	Standard Deviation	Maximum	Minimum
Age (years)	38.7	8.81	64	19
Size of household	4.2	1.36	10	2
Education (years)	9.06	3.08	16	4
Average of respondent's monthly income (thousand Rials)	1,1226.8	7,432.4	49,691	0
Average of respondent's other family members monthly income ($)	6,762.6	6,358	29,814.6	0
Average of respondent's monthly cost ($)	9,411.2	1778.2	19,978.4	2,981.8

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Table 2. Distribution of visitors' education

Expression	Type of the highest achieved level of education					
	Ph.D	M.A.	B.S.	Associated degree	Diploma	Under diploma
Numerical	3	22	39	9	40	39
Percentage	1.97	14.47	25.65	5.92	26.31	25.65

Table 3. Distribution of visitors' jobs

Expression	Type of visitor's job						
	Doctor	Self-employed	Employee	Housewife/husband	Worker	Unemployed	Other
Numerical	4	51	33	35	5	3	21
Percentage	2.63	33.55	21.7	23.02	3.28	1.97	13.81

who answered "yes", the second question was "Are you willing to pay 50,000 Rials for the protection of Kabudval Forest Park?" 65 people answered "no" and 19 answered "yes". 56 people who responded "No" to the first bid were offered 30,000 Rials, 13 of them accepted to pay it and 43 did not.

The results of the estimated Logit model for Recreational Value using the Maximum Likelihood method are presented in Table 6. According to the results, the effects of income, size of household, education variables on the acceptance of the offered price as an entrance fee for the Recreational Value of Kabudval forest park were statistically significant and less than at a 10% level. The age factor is not statistically significant. For the bid factor as the most important factor of probable WTP for recre-

Table 4. Distribution of park quality

Quantity	Classification of the park quality			
	0–5	6–10	11–15	16–20
Numerical	3	1	18	130
Percentage	1.97	0.65	11.84	85.52

0-5 – poor, 6-10 – fair, 11-15 – good, 16-20 – very good

Table 5. Descriptive statistics of visitors' response to bids

Offered price (Rials)	Visitor's response to bids	
	Yes	No
40,000	96	56
50,000	19	77
30,000	13	43

Table 6. The results of the Logit Model for the Recreational Value of Kabudval Forest Park

Variables	Coefficients	*t*-statistic	Weighted elasticity	Marginal effect
Intercept	2.26	1.39	–0.2369	–
Income	0.0049	3.83*	1.1739	0.0017
Size of household	–0.152	–2.72**	–0.2016	–0.033
Education	0.3677	3.45*	2.3847	0.1328
Bid	–0.00214	–4.83*	–3.6871	–0.002
Age	–0.0108	–0.38	0.1312	–0.010
McFadden's *R*-squared = 0.44		Probability (LR statistic) = 0.0000		LR statistic = 50.06%

*,**significant level at 1% and 5%

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ational value, the estimated coefficient was significant at a 1% level with the expected negative sign. Based on the weighted elasticity, it indicates that under the assumed market scenario, a 1% increase in the bid causes a 3.68% decrease in the probability of "yes" in WTP. Also, concerning the marginal effect, one unit increment in the offer price leads to 0.2% decreases in the probability of "yes" in WTP. The income and education coefficients are also statistically significant at the 1% level with the expected positive sign indicating a direct relationship between these variables and the dependent variable. Considering the elasticity of income and education variables, a 1% increase in them increases the probability of the offered price acceptance by 1.1739 and 2.3847%, respectively. Also, concerning the marginal effect, one unit increase in these variables would result in an increase in the willingness to pay to 0.17 and 13.28%, respectively. The estimated coefficient of the household size has become statistically significant at a 5% level with a negative sign, which shows that the probability of the answer "yes" decreases with the increasing household size.

The explanatory power of the model was shown through McFadden's R-squared and LR statistics. The likelihood ratio (LR) of 50.06% shows that the applied model was significant at a higher level (> 1%). The result of McFadden's ratio (0.44) indicated that the model explanatory variables sufficiently explain the dependent variable changes.

The average of the expected value of WTP was obtained after estimating the parameters of the logit model using the maximum likelihood method, which represents the recreational value of Kabudval Forest Park. The mean of WTP was estimated through numerical integration over the domain of 4,964 Rials (the minimum amount paid by the respondents) to 100,000 Rials (the maximum amount paid by respondents) as follows (Eq. 11):

$$E(WTP) = \int_{4,964}^{100,000} \left(\frac{1}{(1 + e^{(-9.86+0.002BID)})}\right) dBID = \\ = 34{,}850 \text{ Rials} \quad (11)$$

where:

dBID – differential of offered or proposed price by visitors.

According to Equation 11, the average WTP for the recreational value was estimated to be 34,850 Rials for each visitor annually. Now, to calculate the annual recreational value of each hectare of the park, we must multiply the amount of WTP obtained by the total number of yearly visitors to the forest park and then divide it by the area of the park (Costanza et al. 1997):

The recreational value of each hectare = (the total number of visitors* the average of WTP)/area. The total number of visitors to the Kabudval Forest Park in 2017 was 400,000 people and concerning the total area 109 ha, therefore, the total and per hectare recreational values of Kabudval forest park annually are:

(*i*) Total recreational value of park = mean of WTP * the number of total annual visits

(*ii*) Total recreational value of park = 13,938,266,000 Rials

(*iii*) Per hectare recreational value of park = 127,874,000 Rials.

The results of our study were similar to those obtained by Abedini et al. (2016), Mansouri et al. (2014), Hashem Nejad et al. (2011) and Chen, Qi (2018). A significant positive impact was found between the visitors' income and visitors' education on the acceptance of the park entrance fee. These are the main factors that encourage the visitors to come to Kabudval forest park, so the findings were approved by Endalew et al. (2019). In other words, people with a high level of education and income have a great demand to use the recreational area for leisure and show their positive tendency to preserve their environmental and natural resources from damaging factors. The results of the study showed that the variables household size and visitors' age show an inverse relationship with the average of WTP, so that when the age and family size rise, the WTP is reduced. The impact of these variables on WTP was discussed earlier by Forster (1989) in Europe and Mansouri et al. (2014) in Iran, and their results are in line with the findings of the present study.

CONCLUSION

This study determined the recreational value of Kabudval Forest Park in Aliabad Katol Golestan province based on the park visitors' WTP an entrance fee. The contingent valuation method and dichotomous-choice questionnaires were used. The results showed that the average WTP of Kabudval Forest Park was 34,850 Rials for each visitor and also, the recreational value was estimated to be

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127,874,000 Rials per hectare annually. Since the offered price for all visitors was greater than zero, as well as according to the obtained value of the WTP, it indicates the high environmental and recreational importance of this forest park, which also shows the uniqueness of the forest park. With respect to the high environmental importance of this park and its unique location, officials should strive for maintenance, better management, accessibility of facilities and improvement of the park sanitation. Also, given the greater willingness of educated people to maintain and preserve the park, promoting community public education can help the ecotourism industry.

On the other hand, according to the results of the study, it is recommended to improve the income levels of low-income individuals, encourage and support the private sector to invest in this sector to provide infrastructure and facilities appropriate to other age groups. The results of this study provide useful information for decision-makers in the region to improve and preserve Kabudval unique forest park.

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