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Article

Preferencias sociales para el manejo del Parque Nacional El Chico, mediante experimentos de elección

Social preferences for the management of the *El Chico* National Park, through choice experiments

Enrique Melo Guerrero[1], Rodrigo Rodríguez Laguna[1*], Miguel Ángel Martínez Damián[2], Juan Hernández Ortíz[3] y Ramón Razo Zárate[1]

Resumen

El objetivo de la presente investigación fue estimar los beneficios económicos derivados de la implementación de un plan de mejoras al manejo en el Parque Nacional El Chico, así como determinar el orden de preferencias de las áreas de intervención que lo componen. Se aplicó el método de experimentos de elección y se realizó una encuesta a 184 visitantes. El ejercicio incluyó una prueba para la detección y corrección de respuestas inconsistentes con el fin de disminuir las fuentes de sesgo en las estimaciones. Mediante el modelo *logit* multinomial se encontró que la disponibilidad a pagar marginal agregada fue de $25.75 pesos (1.35 USD) adicionales a la tarifa actual de entrada al parque por persona. El área de intervención más valorada fue la regulación del turismo en nivel permisivo, seguido del manejo de combustibles activo, vigilancia intensiva y sanidad forestal en nivel activo. Se concluye que los visitantes al Parque obtienen un mayor nivel de utilidad ante cambios en la regulación y ordenamiento de las actividades turísticas. La detección y eliminación de respuestas inconsistentes permitió mayor precisión en la estimación de los beneficios sociales y mantuvo el orden de preferencias de los principales atributos seleccionados por los entrevistados. Estas preferencias deben ser valoradas por los administradores del Parque para decidir su coincidencia con los propósitos de conservación del mismo, de acuerdo con lo previsto por la legislación ambiental vigente.

Palabras clave: Disposición a pagar marginal, *logit* multinomial, Parque Nacional El Chico, plan de mejora, preferencias sociales, valoración económica.

Abstract

The aim of this study was to estimate the economic benefits from the implementation of a management improvement plan in *El Chico* National Park, as well as to determine the order of preferences of the intervention areas that comprise it. The method of choice experiments was used and a survey of 184 visitors was conducted. The exercise included a test for the detection and correction of inconsistent responses in order to reduce the sources of bias in the estimates. Through the multinomial logit model, it was found that the availability to pay marginal added was $ 25.75 additional pesos (USD $1.35) to the current entrance fee to the park per person. The most valued area of intervention was the regulation of tourism at the permissive level, followed by active biomass management, intensive surveillance and forest health at the active level. It is concluded that visitors to the park obtain a higher level of utility in the face of changes in the regulation and ordering of tourist activities. Likewise, the detection and elimination of inconsistent responses allows greater precision in the estimation of social benefits and keeps the order of preferences of the main attributes selected by the interviewees, which must be assessed by the managers in order to decide their match for the purposes of conservation of the park according to the provisions of the current environmental legislation.

Key words: Marginal willingness to pay, multinomial logit, *El Chico* National Park, improvement plan, social preferences, economic valuation.

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[1]Universidad Autónoma del Estado de Hidalgo, México.
[2]Colegio de Postgraduados, México.
[3]Universidad Autónoma Chapingo, México.
*Autor por correspondencia; correo-e: rodris71@yahoo.com

Introduction

Choice Experiments (EE, for its acronym in Spanish) is a method that provides information on the economic value of environmental services that do not have a transaction in the market (Hensher *et al*., 2005; Carson and Czajkowski, 2014). In this study, its application was oriented to quantify the social benefits from changes in the environmental policies of the *El Chico* National Park, Mexico, as to estimate the value of its attributes and its ranking (Riera and Mogas, 2006; Cerda, 2011; Turner, 2013; Brouwer *et al*., 2016; Melo *et al*., 2020).

Salensminde (2002) and Hess *et al*. (2010) identified that the empirical application of the EE method for the assessment of environmental goods and services shows a certain tendency to choose those alternatives that imply some type of improvement without the associated costs; later, Rocamora *et al*. (2014) analyzed the impact of the use of inconsistent observations on measures of well-being, derived from inconsistent responses with some of the axioms of rational choice by the interviewees. These authors used an interactive process to detect and correct inconsistencies and avoid missing observations for analysis.

There is empirical evidence of the use of EE in the assessment of social preferences for management in protected natural areas (ANP, for its acronym in Spanish) in Mexico proposed by Tudela (2010). In *Isla Navarino, Chile,* Cerda (2011) addressed the problem of conflicts between community development and conservation options and estimated the economic value of environmental services provided by forest ecosystems.

In Mexico, the ANPs lack personnel to carry out the activities provided for in the legislation and in the corresponding management programs, due to a shortage of assigned resources. Likewise, it is frequent that those responsible for the administration of the ANP conduct policy decisions without taking into account the participation of the population living in the communities or their area of influence, which favors lack of interest of the inhabitants in conservation activities (Durand, 2010). This shows that issuing ANP creation decrees as a conservation strategy alone in developing countries is a measure that has been

insufficient, and questions the scope of this conservation policy used throughout the world (Durand and Jiménez, 2010).

The aim of this study was to determine the order of social preferences of an improvement plan for the management of the *El Chico* National Park in four intervention areas (fuel management, forest health, tourism management and surveillance), through experiments election, in order to facilitate decision-making for those responsible for its administration, as well as for promoters of community ecotourism.

Materials and Methods

The research study was carried out in *El Chico* National Park, whose extent is 2 739-02-63 hectares and is located between the extreme coordinates of 20°10'10'' to 20°13'25'' N and 98°41'50'' to 98°46'02'' W. The altitude interval is from 2 320 m in the north to 3 090 m in the south and includes the *Mineral del Chico, Pachuca* and *Real del Monte* municipalities (Conanp, 2005). This ANP has forest ecosystems, provides environmental services to the region, natural and cultural entertainment that work as a tourist offer for two nearby population centers (*Pachuca* and Mexico City).

The EE method has its theoretical basis in the consumer's choice model; Tudela-Mamani and Leos-Rodríguez (2018) point out that "Lancaster breaks with the traditional theory of consumer behavior by supposing that consumers demand goods by virtue of their characteristics", which generate utility. Likewise, the theory of random utility assumes that a perfectly rational individual chooses the alternative that implies the greatest expected utility.

The method consisted of presenting to the interviewees who went to the park, sets of options that contained attributes with different levels of intervention associated with one more attribute or price (which in this case corresponded to an increase in the current rate of access to recreational sites where the interview was taken), and they had to choose the preferred alternative. The sets were made up of a constant option that denotes the current situation known as *status quo* and two improvement plans. The choice reflected

his (her) preference for the attributes of one alternative over the other two; that is, they valued the changes in the attributes of their preference, which allowed them to transform their answers to estimates into monetary magnitudes.

The benefit obtained by the interviewees, given their choices made, is represented through the expression (Blamey *et al.,* 1999):

$$U_{ij} = V_{ij}(Z_{ij}, S_i, M_j) + \epsilon_{ij}$$

Where:

V_{ij} = Indirect benefit function

Z_{ij} = Level of attributes

S_i = Socioeconomic characteristics of the users

M_i = Income of the users

ε_{ij} = Unobservable component of random error

For each alternative of the choice set, the indirect benefit function depends on the levels taken by the attributes, the socioeconomic characteristics of the users and their income.

The probability that an individual chose option *m* over any option *j*, of the set of choice *C*, was expressed as the probability that the utility of the first one was greater than that of the rest, that is (Hess *et al.,* 2010):

$$Pr[(U_{im}) > (U_{ij}) \forall \neq m] = Pr[(V_{im} - V_{ij}) > (\varepsilon_{ij} - \varepsilon_{im})]$$

The observable component of utility (V_{ij}) can be expressed as a linear function of the explanatory variables (Hess *et al.,* 2010):

$$V_{ij} = \alpha_j + \beta'Z + \gamma(M_i - Tarifa) + \delta'S$$

Where:

α = Specific constant for each alternative

β = Vector of utility coefficients associated to the *Z* vector of explanatory variables

γ = Coefficient associated to the price of the *j* alternative, *jRate*

M = Income of the users

δ = Coefficients vector associated to the socioeconomic *S* variables (Blamey *et al*., 1999)

Under the assumption that the error terms are independent and identically distributed with the Gumbel distribution or extreme value type I, the probability of choosing alternative *m* was expressed with a multinomial logit (LMN) model, which contains the attributes to be evaluated and the characteristics of individuals (McFadden, 1974):

$$Pr\left[\left(U_{im} > U_{ij}\right)\forall \neq m\right] = \frac{exp^{\omega(v_{ij})(Z_{ij},S_iM_i)}}{\sum exp^{\omega(v_{ij})(Z_{ij},S_iM_i)}}$$

Where:

ω = Not estimated scale parameter, regardless of the function parameters (Álvarez-Faricio *et al.* 2005) and is normalized as one (Ben-Akiva and Lerman, 1985)

One of the characteristics of LMN is the implicit assumption of independence of irrelevant alternatives, which indicates that the disturbances are independent and homocedastic. The parameters of the indirect utility function are estimated using the maximum likelihood method (Greene, 2003).

The estimated parameters of the additive model can be interpreted as marginal effects of the attribute of the asset to be assessed on the probabilities of choosing one of the plans;

the marginal willingness to pay (DAPMg) of each intervention area is the willingness to pay for a unit change in each of them while the rest remain constant. The DAPMg of the attributes analyzed results from dividing the estimated coefficient of each attribute (-βi) by the coefficient of the tariff attribute (γ) (Alpizar *et al*., 2001).

Choice Experiment Design

Before the application of EE, a diagnosis of the environmental situation and management of the protected natural area was made. It was observed that the tourist activity is associated to the negative impacts that come from pets, garbage production, damage to vegetation, erosion, among other problems. The increase in tourism in recent years encourages service providers and local authorities to undertake activities within the park that are contrary to their management category (introduction of ATVs outside established sites, installation of new infrastructure, massive events, for example).

The number of visitors to the park is usually relatively low, but it increases in the summer and winter holiday periods and reaches its highest point at Easter, which worsens the problem of lack of surveillance and causes tourism to be almost uncontrollable in this time of the year (SemarnatH-Conanp, 2018).

On the other hand, the Park houses old-growth forest specimens of at least 150 years (Avilés-Hernández *et al.,* 2009), as a result of passive conservation policies in forest management. This is also reflected in the accumulation of fuels in the soil of 74.80 Mg ha^{-1} (Estrada and Ángeles, 2007), which increase the risk of fire and the incidence of pests such as bark insects; the damage caused by these pests in 2005 amounted for 8.60 % of the tree mass per hectare (Conanp, 2005). This demands the implementation of strategies that guarantee the conservation and efficient management within this ANP.

Selection of levels and attributes

Based on the above, with the support of specialists in forest management and the consensus of the research group, the attributes or areas of intervention to be evaluated were determined: i) fuel management, ii) forest health, iii) tourism management and iv) surveillance. In this selection, the construction of viable, realistic situations was considered, as to cover possible preferences of the interviewees (Table 1).

Table 1. Attributes and levels of the choice experiment for the assessment of the improvement plan in *El Chico* National Park.

Attribute	Level
Fuel management	Passive, basic and active
Tourism management	Without regulation, permissive and restrictive
Forest health	Passive conservation, basic and active
Surveillance	Lack of surveillance, basic and intensive
Increase in the present fee*	$0, $15, $30, $45 y $60

*The access fee to the sites administered by the Secretary of Environment of the State of Hidalgo at the time of the investigation was MX $ 38.00 Current situation in bold.

For Fuel Management, the current situation was defined as *passive conservation*, which implies constant accumulation of fuel in the forest. The first level of intervention proposed consisted of extraction of the dead standing trees - a measure whose ecological disadvantages were not considered in the EE; it was named *basic conservation*. The second level of intervention was identified as *active*

conservation and took into account the first actions, in addition to the removal of the decaying adult trees.

The Tourism Management attribute in its current situation shows that the activity is poorly regulated. Improvement actions involve their ordering and regulation. The first level of intervention proposed was called *permissive tourism*, which considered regulating the activities of the camps and massive events, although it allows access to the park with pets (only on a leash) and access with ATVs only by authorized routes. The second level proposed was identified as *restrictive tourism*, which, unlike permissive tourism, completely prohibits access with pets, ATVs, and massive events.

In the Forest Health attribute, actions for permanent monitoring and control of forest pests and diseases are proposed. The first level of intervention was called *basic conservation* and consists of applying control of active shoots and trees with irreversible damage; the second level or *active conservation* included the first activities in addition to the application of restoration measures in the affected areas.

For Surveillance, the first level of intervention consisted of providing training to park rangers currently available (*basic surveillance*) and as a second level it was suggested that, in addition, their number should be increased in times of high tourist influx (*intensive surveillance*).

For the establishment of the levels of the Fee attribute, a pilot test was applied in which the interviewees were asked about the increase in the current fee that they would be willing to pay for their access to the park in order to implement the improvements in the conditions of the site in the indicated attributes, that is, to go from the current situation to one with intervention.

According to the number of attributes and levels described in Table 1, there are 64 different combinations of scenarios 2^4*4^1 (in this estimate the current condition was not considered), which means that applying the survey with the same number of cards would be a complex situation. Therefore, a fractional factor analysis that minimizes the correlation between attributes was used (Bennett and Adamowicz, 2001). The combination of attributes and levels (through orthogonal design) was

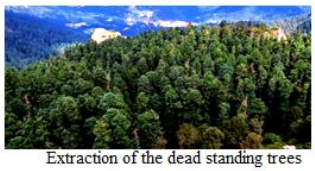
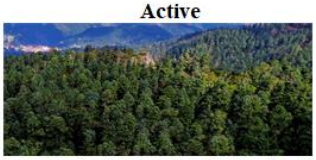
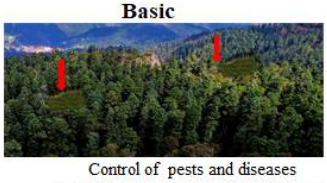
performed with the SPSS® statistical package (IBM SPSS Statistics, 2015); 16 plans or alternatives were developed that represent optimal, orthogonal (there is no correlation between attributes and levels) and balanced scenarios (each level appears in the attribute the same number of times).

These combinations were divided by means of factor blocking in order to decrease the number of tasks of choice and avoid possible sources of bias (Oehlmann *et al*., 2016). The procedure generated four different versions of the questionnaire, each of which contained four choice tasks (cards) for each interviewee and constructed from the procedure developed by Street *et al*. (2005).

Questionnaire design

The questionnaire was formulated with three sections. In the first one, the asset and its importance were presented to the interviewee with general questions and questions of environmental perception. The second included questions related to the evaluation of attributes of the asset and selection of the most preferred alternative, that is, the experiment of choice (Table 2). The assessment exercise was exposed to each interviewee and, by means of images, the current situation and intervention were described. The last section included questions about the interviewee's socioeconomic characteristics, to integrate them as explanatory variables in the econometric model.

Table 2. Example of the election card.

Attribute	Alternative A	Alternative B	Current situation
Fuel management	**Basic**  Extraction of the dead standing trees	**Active**  Removal of the decaying adult trees	**Passive**  Fuel accumulation
Forest health	**Active**  Control and restoration of affected areas	**Basic**  Control of pests and diseases (active shoots and trees with irreversible damage)	**Passive**  Continuous phytosanitary affectations
Tourism management	**Restrictive**  Regulated camps	**Permissive**  Campss and massive regulated events	**Without regulation**  Campss and massive unregulated events
Surveillance	**Increase park rangers** 	**Training to park rangers** 	**Lack of surveillance** 
Fee increment ($)	**$30**	**$45**	**$0**

To identify and correct the inconsistent choices of the interviewees and avoid bias in the DAPMg estimates, the iterative procedure suggested by Rocamora *et al.* (2014) was used, although the exercise was carried out personally in this case.

The interviewees were asked about their maximum willingness to pay (DAP), in a scenario in which the attributes reached the ideal levels of intervention. If in the choice experiment the selected alternatives implied higher rates than those of the DAP, then it was indicated that the exercise had inconsistencies, so they were given the option to reconsider the answer; that is, to do the exercise again taking into account the restriction, and if so, the new choice was recorded in the questionnaire (second interaction). Based on the above information, two models were proposed:

Model 1, which incorporates the total data from the first choice (with inconsistencies), and Model 2, which replaces the observations that the interviewees agreed to correct.

Sample and data collection

Sample size was calculated based on simple random sampling and the population proportion method for finite populations was used (Tapia and Suárez, 2012). According to the entrance control, 5 072 visitors attended the different places located inside the park during 2018; based on the average family size of households in Mexico of 4 members (Conapo, 2012), a sample universe of 1 268 individuals was estimated. In total, 184 questionnaires were applied to heads of families or over 18 years old on the weekends from January to April 2019, at seven different sites in the park.

Variable coding

Before the estimation procedure, coding variables was performed to determine the effects of the attributes (Holmes and Adamowics, 2003). This implies that two variables resulted from each attribute, one per intervention level. For example, the fuel management attribute (MC) generates the variables Active Fuel Management (MCA) and Basic Fuel Management (MCB); if the interviewee selected the "Active" level, the value equal to 1 was assigned to MCA and 0 to MCB; if the "Basic" level was chosen, then the value of 0 was assigned to MCA and 1 to MCB. When the interviewee selected the *status quo*, the variables took the value of -1, as shown in Table 3. The rest of the variables are coded the same way.

Table 3. Coding of attribute effects.

Chosen level	Fuel management		Forest health		Tourism management		Surveillance	
	MCA	MCB	SFA	SFB	GTP	GTR	VB	VI
Active	1	0	1	0	1	0	1	0
Basic	0	1	0	1	0	1	0	1
Statu quo	-1	-1	-1	-1	-1	-1	-1	-1

SFA = Active Forest Health; SFB = Basic Forest Health; GTP = Permissive Tourism Management; GTR = Restrictive Tourism Management; VB = Basic surveillance; VI = Intensive surveillance

Results and Discussion

Sample analysis

The obtained sample was made up of 54 % men and 46 % women, the vast majority of whom were under 40 years old (67 %). 86 % of them attended high school and 20 %, postgraduate studies. Visitors come mainly from three states of the Mexico (68 % of the sample): *Hidalgo*, Mexico City and the State of Mexico, and they go to family nuclei of four people on average. Table 4 presents in more detail the socioeconomic characteristics of the visitors interviewed.

Table 4. Socioeconomic variables of the interviewed visitors for the Choice Experiment in *El Chico* National Park.

Variable	Category	Number	Percentage (%)
Sex	Women	83	45.11
	Men	101	54.89
Age	From 18 to 29	66	35.87
	From 30 to 39	58	31.52
	From 40 to 49	26	14.13
	From 50 to 59	21	11.41
	60 and more	9	4.89
Education	Elementary	19	10.33
	Middle school	7	3.80
	High School	27	14.67
	Undergraduate studies	95	51.63
	Graduate studies	36	19.57
Income (MX$)	Up to5000	30	16.30
	From 5 001 to 10 000	45	24.46
	From 10 001 to 18 000	47	25.54
	From 18 001 to 29 000	31	16.85
	From 29 001 to 41 000	17	9.24
	More than 41	14	7.61
Provenance	Mexico City	65	35.33
	Hidalgo	66	35.87
	Mexico State	29	15.76
	Others	19	10.33
	Foreigners	5	2.72

Of the total number of interviewees, 9.8 % indicated that the current conditions of the site are satisfactory, that is, they chose the option of leaving everything as it is, which means that they were not interested in paying more. On the other hand, four interviewees pointed out that the current rate should already include improvements in the conditions of the place and that it was "an obligation of the authorities to cover the costs", the reason why they were considered protest responses and were left out of the econometric analysis, which led to 180 valid questionnaires.

Each interviewee was shown four choice cards, each with three choice alternatives, from which 12 observations were obtained (4 × 3), and thus it was possible to assemble a database with 2 160 records in total (12 × 180). From the first iteration of the EE, 67 inconsistent responses resulted, and after indicating the inconsistency to the interviewees and when correcting it a second time, the figure was reduced to 23 responses with this characteristic. According to the study of Rocamora *et al.* (2014), the uncorrected ones were left out of Model 2, which amounted to a total of 2 091 observations.

Analysis of econometric results

The results of the estimated econometric models are presented in Table 5; only the variables with a level of significance over 90 % ($P \leq 0.1$) were selected. The significant variables ($P \leq 0.01$) were Permissive Tourism Management, Active Fuel Management and Fee Increase, the latter of which registered a negative coefficient, which indicates an inverse relationship with indirect profit, which is consistent with the economic theory. The Restrictive Tourism Management, Basic Surveillance, Basic Fuel Management and Basic Forest Health variables were not very significant, and, therefore, were excluded from the two models.

Table 5. Econometric results of the conditional logit model of the choice experiment in the evaluation of the improvement plan for the *El Chico* National Park.

Variables	Model 1	Model 2
Active fuel management	0.244***(0.091)	0.297***(0.105)
Active forest health	0.142* (0.091)	0.142* (0.105)
Permissive tourism management	0.305***(0.092)	0.447***(0.107)
Intensive surveillance	0.103* (0.091)	0.187* (0.105)
Fee increment	-0.026***(0.003)	-0.041***(0.004)
Pla_ING1	0.093***(0.024)	0.095***(0.023)
Pla_ESC1	0.538***(0.156)	0.501***(0.154)
Pla_ESC2	0.375***(0.150)	0.432***(0.146)
Verisimilitude logarithm	-680.51	-632.413
X^2	137.98	214.45
McFadden Pseudo R^2	0.092	0.1449
Adjusted McFadden Pseudo R^2	0.0848	0.1379
Number of observations	2160	2091

Source: Based upon the outcome of the conditional Logit model in the NLogit 4.0 package; Significance levels = *P≤0.1 **P≤0.05; ***P≤0.01; Standard error of the coefficients in brackets.

The effect of the interaction between the education and income variables and the specific constants of each alternative was observed, with high levels of statistical significance and positive signs of their coefficients; this means that the higher the income and education level, the greater the perception of the indirect utility of the interviewees in the face of improvements in current park management policies.

On the other hand, the X^2 test in both models rejects the hypothesis that the slopes of the model are equal to zero ($P \leq 0.01$).

Regarding the McFaden R^2, a better fit was verified in the case of Model 2, without inconsistencies, which agrees with the results obtained by Rocamora *et al.* (2014). This confirms the importance of detecting, correcting and, where appropriate, excluding inconsistent responses from the ES in order to avoid bias in the results. This type of responses can be attributed to the greater cognitive load that the EE demands from the interviewees (Hoyos, 2010), who learn to select options as they perform the exercise (Scheufele and Bennett, 2011; Czajkowski *et al.,* 2014). Likewise, a lower education level was observed among the individuals who gave inconsistent responses, which could explain the change in R^2, when moving from one model to another.

It should be noted that in the place where lower education levels and income of the interviewees were found, there was less interest in the survey, which was reflected in more cases of protest answers and a greater number of responses with inconsistencies. This site is also one of those with the highest population concentration and negative impacts on the environment (SemarnatH-Conanp, 2018).

Analysis of the marginal willingness to pay

EE estimates changes in the welfare that comes from the variation in any of the attribute levels. Implicit prices or DAPMg were calculated from the coefficients of the significant variables for both models, in order to compare whether there was any variation in the order of attribute preferences by the interviewees between Model 1 and Model 2; however, it was

observed that, although implicit prices were lower in Model 2, the order of preference remained constant for the two most important attributes (Table 6).

Table 6. Estimation of the Marginal Willingness to Pay of the attributes of the improvement plan for *El Chico* National Park.

Variables	Model 1		Model 2	
	Value ($)	%	Value ($)	%
Permissive tourism	11.62	38.35	10.72	41.63
Active fuel management	9.33	30.78	7.14	27.71
Guards increment	3.93	12.98	4.48	17.39
Active forest health	5.42	17.89	3.42	13.27
Additional DAPMg	30.30	100	25.75	100

The most appreciated attribute by the interviewees was Tourism Management, at its permissive level, which indicates that in the context of the current management of the park there is greater concern for the activities to be carried out in an orderly and regulated manner; that pets are allowed on a leash only, that mass regulated events are held, access by ATVs only along established trails, and that a general regulation of tourist activities be settled in the different recreational sites within the park.

This could reflect the perception of visitors about the pressure of the increase in tourist activity (according to information from the visitor center and interview with municipal authorities, tourist activity has increased markedly in recent years) and the lack of actions for its regulation under sustainable schemes. Cerda (2011), through Experiments of Choice, showed that the preferences of the interviewees pointed to a

low impact development model represented by small-scale tourism, based on different development options that involved some loss of environmental services.

The second place of importance was the Active Fuel Management attribute, which indicates the interest of the interviewees to include the program for the extraction of dead standing trees in the management of the *El Chico* National Park; this activity contributes to the conservation of the landscape and to the reduction of fire risk from fuel accumulation. This result agrees with the results obtained by Tudela (2010) who concluded that visitors to the *Molino de las Flores* National Park, in the State of Mexico, valued improvements in the vegetation cover more than in the rest of the attributes. Likewise, Sosa (2018), identified that the second attribute most appreciated by visitors to the *Cuyabeno* Fauna Production Reserve, Ecuador, corresponded to scenic beauty, which implied improvements in plant cover. These management actions for conservation in *El Chico* National Park must be undertaken in agreement with current regulations in force.

Surveillance is in the third position of importance (Model 2). Visitors do no only consider necessary permanent training of the security guards, but that their number should be increased during the high tourism periods; however, changes in this attribute are less relevant than those related to Tourism and Fuel Management.

Forest Health occupied the fourth place at the active intervention level. Melo *et al*. (2020) established quite the opposite, as in a similar study at *Los Mármoles* National Park, they recorded that this attribute was the best liked, as recently bark beetle outbursts occurred in *Pinus pseudostrobus* Lindl*., P. greggii* Engelm*.* ex Parl*.* and *P. teocote* Schiede ex Schltdl*.* & Cham. This result may be related with the environmental perception declared by the interviews, as they considered that at present the Park is well kept in terms of forest sanitation (as they gave it an average grade of 7.74 in the 1 to 10 scale), which could mean that the visitors prefer to advocate a greater percentage of the fee increment to the intervention areas as they consider them more susceptible.

According to Rocamora *et al*. (2014), Model 2 brings a better fit to the data and eliminates the impact of consistencies, which, in average, the visitors of the Park would

be willing to pay MX$25.75 more to the present day fee in order to implement the program in the four intervention areas in the indicated levels, which guarantees an improvement in the current conditions of the place. It is important that in this kind of studies, procedures for the detection of inconsistent answers with the consumers' theory are applied as well as to include strategies for their correction, in order to avoid loss of information and possible bias sources from the reduction of the sample size, which can be estimated through the calculation of a greater percentage.

Conclusions

The visitors of the *El Chico* National Park have a higher utility level from the changes of regulation and organization of tourism activities, followed by the improvement in fuel management, surveillance and last, for forest sanitation. Since they provide a public service, state authorities must be receptive and understanding of the values and preferences that visitors allocate to the natural legacy of the Park; therefore, they must decide their coincidence with the purposes for its conservation and preservation, that is, to make coincide the social preferences of the visitors with what is foreseen by the actual environmental legislation. The detection and elimination of the inconsistent answers of the interviewees in the empiric application of Choice Experiments, allows a greater accuracy in the appreciation of the local benefits, from the implementation of the improvement program and keeps the order of preferences of the main selected attributes by the participants of the study.

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Conflict of interests

The authors declare no conflict of interests.

Contribution by author

Enrique Melo Guerrero: design of the study, development of methodology and writing of the manuscript; Rodrigo Rodríguez Laguna: data analysis and writing of results and conclusions; Miguel Ángel Martínez Damián, Juan Hernández Ortiz and Ramón Razo Zárate: advisory, review and correction of the manuscript.

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