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Economic valuation of the National Park of Brasilia

Valoração econômica do Parque Nacional de Brasília

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Abstract

This study aimed to analyze the willingness of the population to pay for the maintenance and conservation of the National Park of Brasília - NPB, valuing its environmental attributes and contributing to the improvement and preservation of the Conservation Unit. To this end, 385 questionnaires were applied during February, March and April of 2014. The profile of respondents' willingness to pay was analyzed with a logistic regression. The estimated willingness to pay was R$ 9.31/month, paid mainly by people who know the NPB and with better economic situation. This shows that the population of interest revealed a significant desire to contribute to the park.

Keywords: Environmental valuation; Contingent valuation; Willingness to pay

Resumo

Este estudo teve como objetivo analisar a disposição da população de pagar pela manutenção e conservação do Parque Nacional de Brasília - PNB, valorando os seus atributos ambientais e contribuindo para a melhoria e preservação da referida Unidade de Conservação. Para tanto, 385 questionários foram aplicados durante fevereiro, março e abril de 2014. A disposição a pagar e o perfil dos entrevistados foi analisado com uma regressão logística. A disposição de pagar estimada foi de R$ 9,31/mês, paga principalmente pelas pessoas que conhecem o PNB e com melhor situação econômica. Isso mostra que a população de interesse revelou um desejo significativo de contribuir para o parque.

Palavras-chave: Valoração ambiental; Valoração contingente; Disposição a pagar

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1 Introduction

The interest in protecting natural areas arose in the middle of the nineteenth century when the concept of nature protection was established after the creation of reserved spaces, free from human activity and controlled by the government. The foundation of the first American national park took place in 1872. The Yellowstone National Park is a reference on the conceptual basis for the creation and management of modern protected areas worldwide (NPS, 2015).

The idea of a national park has spread rapidly around the world. Inspired by the American experience, in 1937 Brazil created its first national park named Itatiaia (Araújo et al., 2012). In 1961, during the construction of the country's new capital, the National Park of Brasília (NPB) was created with about 30 thousand hectares. Ordinary law number 11,285 of 2006 redefined its limits, adding its area to 42,389 hectares.

The NPB is considered a public good of restricted use. It is classified under the category of a national park with indirect use management, having its territorial space delimited and surrounded. It emerged with the necessity to protect natural ecosystems of great ecological importance and scenic beauty. It aims to guard the typical flora and fauna of the Cerrado as well as the crystalline water springs that provide drinking water to the federal capital. The NPB, besides contributing with the balance of climatic conditions and avoiding soil erosion, seeks to make possible the accomplishment of scientific research projects and foster the development of environmental education, outdoor recreation, and ecological tourism activities. Thus, it has less than 1% of its area open to visitors, but it has a recreation and leisure area, known as Mineral Water Park, with a museum, library, pool area and two trails (ICMBIO, 2015).

Due to its proximity to the metropolis of Brasília, the park has a peri-urban dynamic that generates conflicts and impacts around the Park. One could mention an irregular occupation (Chácara Santa Luzia), an open-air dump as a neighbor, exotic species of plants and animals proliferation, fires and an accelerated and disorderly urban growth around the Park.

Despite the importance of natural resources, the lack of adequate management and economic valuation of the biodiversity and environmental services contribute to the ecosystem degradation. The impacts sometimes are irreversible, reducing or weakening the capacity and the potential to provide services as well as well being, with negative consequences for the current and future generations (Malta et al., 2012).

One of the alternatives to minimize negative externalities, according to Silva (2003), would be through environmental valuations, which lies in estimating a reference value that indicates a market price for environmental resources. With this economic assessment, the public and private agents would have subsidies to evaluate political decisions regarding the efficient use of these assets. The creation of a reference value for an environmental good provides information to public authorities, organized civil society and non-governmental organizations (NGOs), which results in more effective management and use of these resources.

One of the economic instruments of environmental economic assessment is the contingent valuation. It determines the perception of the society and the willingness to pay (WTP) for the conservation and maintenance of an environmental good or service. This approach has been used in several studies. In Brazil, one can mention the work of Schmidt and Bocato (2014), who proposed an average spontaneous willingness to pay of R$ 15.12 per month to visitors of the Ingá Park in Maringá-PR. Bentes et al. (2014) estimated the willingness to pay of artisanal fishermen from Jusante de Tucuruí for the Tocantins River. He found the average value of the WTP of R$ 31.58. Araújo (2014) weighed the benefits of the environmental services in the Salitre grotto, Diamantina, Minas Gerais – Brazil. He encountered that visitors hold an average WTP of R$ 6.48 while surrounding residents would be willing to pay R$ 7.78. Barros (2013) estimated the economic value of the Dunas de Natal State Park in Natal-RN. He recorded a WTP for the maintenance of the Park of R$ 8.47. Almeida et al. (2017) assessed the willingness to pay of the visitors of the Olhos D'Água Park – DF. The average value found of the WTP was R$ 15.80 per month.

This work innovates as it seeks to identify the determinants of the willingness to pay for environmental services provided by the NPB, which means an additional tool for decision-makers to maintain and conserve the Park. Additionally, this article aimed to verify

if the Brasília's society perceives the environmental services offered by the NPB as assets that could increase their well being.

All in all, it was estimated a willingness to pay of R$9,31 / month. It shows that the population of interest revealed a considerable desire to contribute to the park. They recognize NPB as an important natural heritage, and most people interviewed demand the preservation of such environmental asset even if they would have to apply their financial resources.

2 Method

2.1 Environmental asset characterization

Situated in the northwest portion of the Federal District (DF), the park is located at coordinates 15 ° 38'28 "S, 48 ° 1'15" W. The NPB covers the administrative regions of Brasília (DF), Sobradinho (DF), Brasilândia (DF) and Padre Bernardo in Goiás (GO).

As a protected unit managed by the Chico Mendes Institute for Biodiversity Conservation (ICMBIO), it is classified under the category of a national park with indirect use management. The main access to NPB is through the Parque Industrial e Abastecimento - Via EPIA, where the entrances to the Intensive Use Zone (Gate 1, for visitors use) and to the Special Use Zone (Gate 2, for administrative use) are located. The other entrances of the Park are for services only, and access is controlled [3].

The NPB is located approximately 10 kilometers from the center of Brasília. However, the proximity to the city generates pressures of different kinds on the Park. Their wealth is threatened by the open-air garbage deposit in the Structural City that receives the trash produced in the capital (Sampaio, 2006), and the proliferation of exotic plant species (Horowitz et al., 2013) and animals such as vultures, rats, cockroaches and dogs inside the Cerrado conservation unit. Urban critters hunt endemic species and spread diseases, causing imbalances to wildlife.

Cavalcanti (2013) has shown a direct influence of the dump in springs and watercourses. The presence of manure contaminates the water from the stream that is born in the conservation unit, which may compromise the water supply in case of an expansion

of the distribution system in the Federal District. According to the abovementioned author, even the trees near the landfill present heavy metals in their foliage.

According to Silva (2003), other future problems of the park, considering the current characteristics of accelerated and disordered urban growth in the Federal District, concerns the boundaries of the park, which are under pressure because of invasions, large public and private land lots and the construction of highways. Because of this trend, NPB tends to become an "island" surrounded by human-altered environments. This pressure in its surroundings causes forest fires and isolation of the fauna and the flora, compromising the genetic transit and the survival of several species. In this case, the result that can be expected is a high dominance of few species that have good dispersal capacity, together with local extinctions and loss of biodiversity (IBAMA, 2014).

2.2 Economic theory

The Contingent Valuation Method (CVM) estimates a monetary value taken from interviews that tend to reflect the preferences expressed by consumers regarding an increase or decrease in the quality of environmental assets.

There are several ways to do this: auction games, referendum-dichotomous choice (yes/no), the use of a questionnaire, trade-off games, among others (Hufschmidt et al., 1983).

For the present study, the referendum model with auction games, adapted from the methodology proposed by Silva (2003), was used as a final elicitation technique, following the approach of Hanemann et al. (1991). In this way, several values were presented to the interviewees to see if they accepted or not. The initial value did not change throughout the sample.

In Hanemann's referendum or approach model, the assumption is that individuals maximize their utility. The question is posed - Would you be willing to pay an amount "X" in Reais per month to ensure an environmental improvement from q0 to q1, or to maintain q0 environmental quality (Silva, 2003; Hanemann, 1989; Osorio & Correa, 2009)? The answers aim to reflect the preferences of a particular individual.

The individual can answer "yes" or "no", given an indirect utility function, represented by V (I, q, C) where I is income; q is an environmental parameter; and C, a vector of individual socioeconomic characteristics. Thus, the following consumer choices are made:

$V (I – X, q1, C) + e1 – V (I, q0, C) + e0 > 0$ if the answer is ''yes''; (1)

$V (I – X, q1, C) + e1 – V (I, q0, C) + e0 < 0$ if the answer is ''no'' (2)

where e0 and e1 are the random errors.

The consumer will only be willing to pay the proposed R$ "X" amount if the utility gain resulting from the environmental improvement is greater or at least equal to the loss of utility due to the acquisition of a smaller number of other market goods since he now has a smaller income (I - X).

Regarding the probabilities, the equations can be represented as follows:

$P ("yes") = P (CS > X)$ (3)

$P ("no") = P (CS < X)$ (4)

The WTP for environmental change matches the consumer surplus (CS). The CS corresponds to the maximum value that one would be willing to pay. Thus, for a proposed value higher than CS, the individual chooses to remain at the current environmental level (q0). On the other hand, for a value lower than CS, the individual is willing to pay a little more for moving from q0 to q1. If the value proposed and the CS are equal, the individual is indifferent between choosing or not for environmental improvement since any of the choices change his utility level.

Therefore, as the proposed value "X" increases, the greater the probability of the individual answering "no"; and, as the "X" value decreases, the more likely it is to respond "yes".

The individual response is a random variable and has a probability distribution given by:

$P1 = Pr \{accept\};$ (5)

$$P1 = Pr \{V (I – X, q1, C) + e1 > v (I , q0, C) + e0\}; \quad (6)$$

$$P1 = Pr \{ \Delta V > \delta \}, \quad (7)$$

where:

$$V = V (I – X, q1, C) - V (I, q0, C) = e0 - e1, \quad (8)$$

therefore,

$$P0 = Pr \{decline\} \quad (9)$$

$$P0 = 1 - P1 \quad (10)$$

In bidding games, the idea is to create a series of monetary values and negotiate them with the interviewee to obtain the maximum WTP for the change in the environmental good.

What characterizes this method is the direct form of obtaining the WTP in the procedures of field research.

Respondents are iteratively questioned to indicate their maximum WTP. Initially, it is presented a median value to the individual. Then, it is asked if he would be willing to pay an "X" value to maintain or improve the existing environmental parameters. If the answer is ”yes”, a higher bid is offered until the individual decline the bid. On the other hand, if he answers "no" to the first bid, the successor bids would be less than the first one. The auction game ends when the respondent makes the corresponding changes from "yes" to "no" or from "no" to "yes". The maximum WTP is the last bid accepted in the process (Hoyos & Mariel, 2010).

2.3 Econometric models

To estimate the true stated willingness to pay, the logit model was used. This approach is similar to the methodology applied by Hadker et al. (1997) in a study on the willingness to pay for the Borivli National Park in Bombay - India. In the logit model, we first estimate the probability that an individual is willing to pay, and then the price, where the likelihood of obtaining a "yes" response is 50%, considering the maximum value that an individual would be willing to pay.

This model is based on the cumulative logistic probability function, represented as follows:

$$Pi = f(\beta_i X) = \frac{1}{1+e^{-\beta_i X}} \quad (11)$$

Where P corresponds to the probability that the individual i takes the decision (Yi = 1). That is, to accept the proposed value; βXi is an index that represents the characteristics of that individual; i, each observation of the sample used; and "e", the neperian logarithms basis.

The Pi variable is not observed. We observe Yi = 1 when the individual answers ''yes'' and Yi = 0, when the answer is ''no''. Thus, the parameters to be estimated in (11) must be done by Maximum Likelihood (Greene & Caracelli, 1997).

Given that Pj is unobservable, it is estimated by maximum likelihood, with the term Xjβ assuming the following form:

$$Lj = \beta 0 + \beta 1WTPpi + \beta 2MIi + \beta 3Si + \beta 4Ai + \beta 5Fi + \beta 8GRAi + \beta 7Ei + \beta 8Ji + \beta 9Di + \beta 10Ci + \varepsilon i \quad (12)$$

Where Lj = the individual j logit function obtained from the dichotomous variable Yj, which assumes the value 1 when the interviewee accepts the proposed payment to improve and subsequently preserve the environmental quality of the NPB, and 0 otherwise; βi (i = 1 to 10) = the parameters to be estimated; WTPp = the value proposed to the interviewee, aiming at the conservation and environmental improvement of NPB; MI = monthly income of the respondents in Reais; S = one dummy variable: 1 - male, 0 - female; A = age; F = dummy variable: 1 - the respondent attends the Park, 0 = does not attend; GRA = degree of environmental responsibility - the respondent evaluates himself on a scale of 0 to 5; E = highest level of education achieved by the interviewee, being divided into uneducated, with elementary education (middle school), with secondary education (high school), with higher education and postgraduate (first degree); J = dummy variable: 1 - the respondent is employed, 0 = unemployed; D = distance in kilometers from the interviewee's residence to NPB; C = dummy variable: 1 - the respondent knows the park, and 0, otherwise; and ε, the random error term.

The initial expectation is that the estimated coefficients β2, β4, β5, β6, β7, β8 and β10 relate positively to the probability of an affirmative response to contingent valuation. On the other hand, we expect the opposite for β1. As the β3 and β9 parameters, the signals, à priori, were taken as indeterminate.

The selection of the exogenous variables from the abovementioned model is based on the works of Poe et al. (2002), Silva (2003), Horton et al. (2003), Cirino and Lima (2008), Brugnaro (2010), Bhandari and Heshmati (2010).

2.4 Estimation method

The maximum likelihood (MV) method was used to estimate the logit model. This method determines the model parameters by maximizing the likelihood function. The encountered values maximize the probability of finding the answers obtained in the research. To do so, we used the statistical software IBM-SPSS Statistics 20.0 for Windows.

The willingness to pay was estimated from the logistic regression model using only the significant variables.

2.5 Data

The data used in this study was obtained from a primary source. It was collected through interviews in three points of the Federal District: at the Plano Piloto Bus Station, at the Mineral Water Park and at the Darcy Ribeiro Campus of the University of Brasília.

A sample of 385 individuals was constructed from February to April 2014. The questionnaire was divided into three parts, in which the first one was composed by socioeconomic variables (age, sex, occupation, place of residence, educational level and monthly income). The second included questions about ecological knowledge of the park and environmental responsibility. The third part indicated the willingness to pay for park visitors. The questionnaire can be found in Appendix 1.

3 Method

3.1 Socioeconomic profile of sample group

From the total number of interviewees, 42.9% were residents of the Plano Piloto (the distance from the Park is 10km), while 57.1% were located in one of the 22 other administrative regions in the Federal District.

The behavior of NPB's visits for people who already knew the park (299 individuals representing 77.6% of the total sample) was divided into three components. It was shown that 1% visit the park daily, 3.7% weekly, 35.5% monthly and 59.9% almost never.

It was also found that 48.1% of the interviewees were female and 51.9% male. The predominant age group was from 24 to 44 years old (40.9% of the sample), being distributed as follows: from 18 to 24 years old (13.8%), from 25 to 34 years old (20.0%), from 35 to 45 years (20.8%), from 45 to 54 years (18.4%), from 55 to 64 years (16.9%) and more than 65 years (10.1%). In other words, individuals were assigned in one of these 6 age categories.

Table 1 allows for greater inferences about the relationship between the degree of education and the willingness to pay, indicating that the majority presented a higher educational level. This makes possible to raise premises about the link between education and WTP. The willingness to pay versus the level of education informs us that those interviewed with Postgraduate Studies had the greatest propensity to contribute to the maintenance and conservation of the Brasilia National Park since 81.13% of the respondents were willing to contribute. When the interviewees with higher education were observed, it was verified that 64.7% were willing to do so. À priori, it is clear that it cannot be said that the more educated one is, the greater will be his or her willingness to pay for maintenance and conservation of NPB.

Table 1 – Willingness to Pay - WTP versus Education

Education	**Final WTP in R$**										**Total**
	0,00	**1,00**	**3,00**	**5,00**	**10,00**	**12,00**	**15,00**	**20,00**	**25,00**	**30,00**	
Complete Middle School	1	0	0	0	0	0	0	0	0	0	1
Incomplete Middle School	1	0	0	0	0	0	0	0	0	0	1
Complete High School	42	5	10	1	8	4	1	3	0	0	74
Incomplete High School	20	2	1	2	2	0	0	0	1	0	28

Complete Bachelor's Degree	62	1	18	4	27	8	12	20	18	4	174
Incomplete Bachelor's Degree	19	3	2	0	7	1	0	1	1	1	35
Post-graduate	10	1	6	1	10	2	5	6	8	4	53
Technical Degree	11	1	0	1	1	0	0	0	1	0	15
Uneducated	2	1	0	0	1	0	0	0	0	0	4
Total	168	14	37	9	56	15	18	30	29	9	385

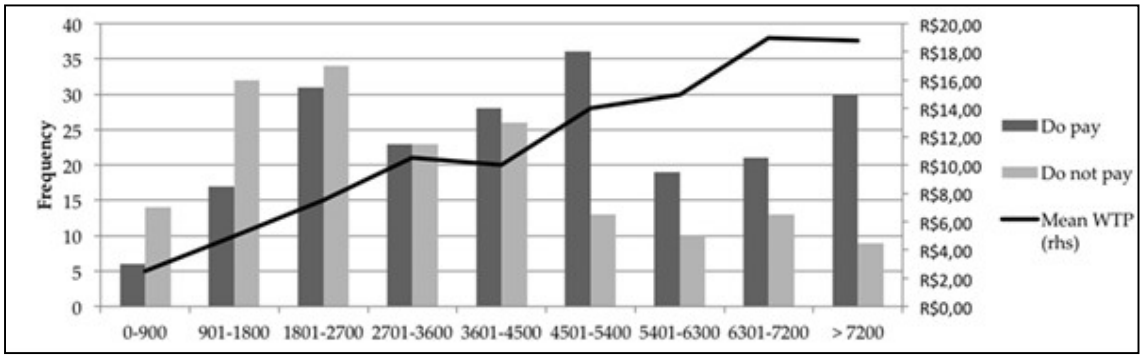
When it comes to the interviewees' degree of education, responses highlighted that 45.2% hold a complete middle school degree, 9.1% an incomplete middle school degree, 7.3% an incomplete high school degree, 19.2% completed secondary school, 13.8% are post-graduates and 3.9% have a technical degree.

From the 126 individuals that were employed at the time of the interview, 69% have a complete first degree. There were 18 businessmen, 50% of them have a bachelor's degree. Out of the 69 students, 56.6% have an undergraduate degree, and 30.4% are post-graduates. From the 82 self-employed individuals, 43.9% did not complete high school and 23.2% completed middle school. From the 14 self-employed professionals, 92.9% have a complete middle school degree. From the 37 unemployed, 54.1% have completed middle school and 22 interviewees have other activities. 50% of those hold a high school diploma.

Regarding the income range, the sample portrayed an interviewees' average income of R$ 4,912.54. This result is similar to the average monthly household income in DF - R$ 5,015.04 according to CODEPLAN (2015). We divided individuals into 9 categories, as shown in Figure 1.

(Continue...)

Figure 1 – WTP Behaviour Vs. Income.



When analyzing the relationship between WTP and income level, it is verified that the behavior of a high WTP is directly proportional to the level of income. It can also be verified that those who earn more than R$ 7,201 concentrate the highest proportion of contributors since 76.92% of respondents would contribute to NPB. This behavior is followed by the highest levels of income and it decreases to the lower limits, as can be seen in Figure 1.

3.1 Protest votes

As for the willingness to pay, it was quantified that 56.4% of respondents would pay some amount for the public good. However, the overall rejection rate is considered high. It was observed that 43.6% of the respondents were not willing to contribute any value for maintenance and conservation of NPB.

The relationship between those who refuse to contribute and the level of education showed a worrying result since 36.90% of the interviewees who were not willing to pay have a first degree and 25.59% hold a high school diploma. Together, these two levels represent 62.49% of the total bias present in this research. These results see eye to eye with Silva (2003).

Several reasons explain the non-payment of the contribution, and the answers to this question were presented in eight categories, as shown in Table 2.

Table 2 – Reasons to explain non-WTP

Reasons why would you not contribute	Answers	
	Frequency (unity)	Percentage (%)
1. I cannot allow this	54	10,7
2. I do not care about environmental improvements	32	6,3
3. The park does not deserve money to be protected	45	8,9
4. It is the industries' responsibility	17	3,4
5. I already pay high taxes	99	19,6
6. I am ok with the current situation	80	15,9
7. It would not increase the security of the park	41	8,1
8. It is the government's responsibility	136	27

The reasons 1, 2, 3, 6 presented in the Table 2 are legitimate motives for refusing to pay. The remaining four statements 4, 5, 7, 8 are protest beliefs. Reasons 4 and 8 argue that financial investment in protecting the environment must be of another party's responsibility. In declaration 4, liability is limited to only polluters. Statement 5 is a standard objection to the selected channel for payment (perception of more taxes), a common reason for protest. Statement 7 expresses skepticism about the effectiveness of the proposed policy, which is expressed in disagreement.

Similar to the findings of Adams et al. (2008), most respondents expressed the opinion that the maintenance of the Park is of responsibility of the government and that they already pay a lot of taxes. There were also a high number of protest votes (38.5%), which demonstrates individuals' dissatisfaction with government policies regarding the preservation of the environment, or simply opposition to any increase in taxes for any purpose.

3.3 Willingness to pay (WTP)

The results obtained with the application of the logit model with all variables described above in the general model were validated from a theoretical point of view. The variables that were not significant were withdrawn from the results. Therefore, only the significant variables are those listed in Table 3.

Table 3 – Model's Significant Variables

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Age	0,224	0,075	8,965	1	0,003	1,251
Monthly Income	0,152	0,053	8,376	1	0,004	1,164
Knows the Park	1,375	0,299	21,106	1	0,000	3,955
Employed	0,802	0,258	9,688	1	0,002	2,230
Proposed WTP	-1,053	0,140	56,481	1	0,000	2,866
Constant	-2,537	0,401	39,934	1	0,000	0,079

4. Discussion

The regression was used to estimate the willingness to pay for the maintenance of NPB by replacing the constant means (medians) and multiplying them by their correspondent parameters calculated by the statistical model of binary choice with only the significant variables. The regression with only the significant variables indicates that the average value, according to the coefficients of the statistical model, is of R$ 9.31 per month. It suggests a proxy for the price that the individual is willing to pay for the maintenance and conservation of NPB.

Therefore, the results obtained by this research are in line with the revised literature, since they did not exceed the values seen in previous studies. The average amount of those willing to pay was R$ 9.31 (nine reais and thirty-one cents) per month. In two similar studies at the National Park of Brasilia, applying the CVM, the authors found a monthly average WTP of R$ 7.88 and the Park TEV was R$ 28,771,819.76 per year (EMBRAPA, 1999). In another study, the willingness to pay was found to be of R$ 6.62 per user/month, representing R$ 1,769,367.10 per year (Mota, 2000).

A non-significant chi-square indicates that the data fit well in the regression. The p-value is desired to be higher than the established cut-off point ($\alpha = 0.05$) to indicate a good fit. With a p-value <0.05, the model is rejected and a> 0.05 shows that the model's fit is good.

In the previous result, the model's Nagelkerk R^2 explained 25.7% of the variability. The value can be considered low, indicating difficulties to explain the WTP with the examined variables. However, the quality of the adjustment is of secondary importance since the purpose of the regression was not to predict the dependent variable but to evaluate the effect of each statistically significant explanatory variable (Gujarati & Porter, 2010).

From Table 3, the statistically significant explanatory variables are consistent with the economic theory. First, the proposed WTP variable has a negative coefficient. Thus, there is an inverse relationship between the WTP and the suggested price. It happens because the higher the proposed quantity to be paid, the less likely the interviewee is to respond affirmatively in the hypothetical market scenario.

Second, the decision of the individual depends on his budget constraint, determined by his monthly income. The higher the income is, the greater the willingness to pay will be as well. This is theoretically correct because the higher the income of the consumer is, the greater in absolute terms will be his surplus. If the signal were opposite to what theory predicts in this contingency valuation exercise, the validity of this experiment would certainly be questioned (Hoyos and Mariel, 2010; Bishop et al., 1995).

The occupation is another factor that positively influences the WTP decision. It was shown that employed individuals, with a secure monthly income, are willing to pay more to support natural resources. The model suggests that knowledge of the environmental good is positively related to individuals' willingness to pay.

On the other hand, even being tested in an exploratory way, age is also positively related to willingness to pay. Age serves as a learning experience, which can influence decisions. It makes sense with the value of inheritance or option value that is related to the willingness of the individual to ensure the preservation of the environment for the benefit of their descendants in future generations (Padilla & Rocabert, 2002; Cottrell, 2003).

In this study, a significant WTP value was reached. It demonstrated that the population of interest revealed a considerable desire to contribute to human well-being. It was also acknowledged that individuals perceive NPB as an important natural patrimony for regional and national wealth. Most of the inhabitants (56%) are aware of the importance of preserving this environmental asset, even if it was necessary to forego their own financial resources to support the environmental program. In this sense, the Government should develop projects and public policies aimed at the preservation and sustainable use of NPB.

5. Conclusions

There is a willingness to pay for the conservation, preservation, and maintenance of the National Park of Brasilia. It was quantified that 56.4% of the respondents would be willing to pay, revealing a contribution that aims at human well-being, which indicates a conservationist initiative and a self-preserving behavior.

The variables that influenced the WTP in this study were: proposed WTP, age, monthly income, profession, know the park. It was reached an average monthly payment of R$ 9.31. This result sees eye to eye with other studies in Brazil, which could highlight a market concerning the use of this environmental asset.

From the results, it is possible to perceive the social conscience that improvements or damages in the NPB can reflect in the well being of the population. Thus, we conclude that the interviewees demonstrate the willingness to pay to maintain the quality and quantity of goods and services provided by NPB.

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Appendix 1. Questionnaire

1. Would you be willing to monthly contribute with R$ 10,00 to help in the conservation and maintenance of the National Park of Brasília? (It would be charged along with the energy bill)

a) ( )Yesb) ( )No

2. (If the answer is YES) How much would you be willing to contribute?

a) ( ) R$ 12 c) ( ) R$ 20 e) ( ) More than R$ 30

b) ( ) R$ 15 d) ( ) R$ 25 f) _____

3. (If the answer is NO)

a) ( ) R$ 7 c) ( ) R$ 3 e) ( ) R$ 0

b) ( ) R$ 5 d) ( ) R$ 1

4. Protest Votes. Select 3 options from the categories of reasons why would you not contribute

1st2nd3rd

a. I cannot allow this ( )( )( )

b. I do not care about environmental improvements ( )( )( )

c. The park does not deserve money to be protected( )( )( )

d. It is the industries' responsibility( )( )( )

e. I already pay high taxes( )( )( )

f. I am ok with the current situation( )( )( )

g. it would not increase the security of the park( )( )( )

h. It is the government's responsibility( )( )( )

5. Sex:

a) ( ) Male b) ( ) Female

6. Age range:

a) ( ) 18 - 24 c) ( ) 35 – 44 e) ( ) 55 - 64

b) ( ) 25 - 34 d) ( ) 45 - 54 f) ( ) More than 65.

7. Place of residence (distance from National Park of Brasília).

a) ( ) Plano Piloto 12 km h) ( ) Brasilândia 48 km o) ( ) Guará 17 km

b) ( ) Candangolândia 16 km i) ( ) Ceilândia 27 km p) ( ) Planaltina. 37 km

c) ( ) Cruzeiro 10 km j) ( ) Riacho Fundo 25 km q) ( ) Gama 40 km

d) ( ) Núcleo Bandeirante 19 km k) ( ) Lago Norte 13 km r) ( ) Santa Maria 53 km

e) ( ) Paranoá 25 km l) ( ) Samambaia. 29 km s) ( ) Outra _____

f) ( ) Recanto das E. 36 km m) ( ) Taguatinga 23 km

g) ( ) Sobradinho 17 km n) ( ) São Sebastião 47 km

8. Education.

( ) Uneducated ( ) Incomplete Middle School ( ) Complete Middle School

( ) Incomplete High School ( ) Complete High School ( ) Complete Bachelor's Degree

( ) Incomplete Bachelor's Degree ( ) Post-graduate ( ) Technical Degree

9. Occupation

( ) Employee ( ) Employer( ) Student

( ) Self-employed( ) Retired / pensioner( ) Unemployed

( ) Other (housewife)

10. Monthly Income

( ) R$ 000 - 900 ( ) R$ 2701 – 3600( ) R$ 5401 - 6300

( ) R$ 901 - 1800 ( ) R$ 3601 - 4500 ( ) R$ 6301 - 7200

( ) R$ 1801 - 2700( ) R$ 4501 - 5400 ( ) More than R$ 7.201