**Are visitors willing to pay for a green park? A study in a Brazilian ecological park**

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**ABSTRACT**

This study aims to verify the willingness of visitors in contributing towards the preservation and conservation of Rio Cocó Ecological Park. The Contingent Valuation Method [CVM] was used with estimation of the values of the Willingness to Pay [WTP]. This is a descriptive and quantitative study conducted through a survey in which 159 questionnaires were applied with park visitors. The techniques of descriptive analysis, logistic regression and calculation of total WTP were used. The results indicated that 58% of respondents are willing to pay to visit the park. As for the sample, it was evidenced that: 64% were female; 25% had dependents; the average number of visits to the park was 2.09 visits per year; the mean age was 29.69 years; and the average salary of the respondents was R$ 3,669.00. Logistic regression reveals that family income, gender and number of dependents have positive influence on WTP while schooling and conservation influence negatively. There was also an average WTP of R$ 11.53 to visit the park and a total WTP of R$ 44,194.49 per month. It is concluded that most visitors are willing to pay to enjoy the ecological park in exchange for improvements in its preservation and conservation.

**Keywords:** Environmental Economic Valuation. Contingent Valuation Method. Willingness to Pay. Rio Cocó Ecological Park.

# 1 INTRODUCTION

The consumption of environmental resources generates several benefits and is mainly reflected in the general well-being of individuals. Some benefits can be valued more easily because they are related in some way to the market system (food production, for example). However, some goods and services generated do not have market prices which make it difficult to measure them (Pearce, 1993). According to Randall (1987), this is because natural resources are public goods and therefore are common resources, free access and undefined property rights.

With the absence of a market that serves as a parameter, the establishment of a monetary value for these benefits is hampered. One of the solutions used to overcome this difficulty is the implementation of environmental valuation methods which value and attribute values to the goods and services generated by the environment (Finco, Rodrigues, Rodrigues, Barbosa & Silva, 2005).

Methods such as Contingent Valuation take into account the fact that people express their preferences every day and thus use monetary values to indicate gains and losses in their usefulness or well-being. When individuals indicate their willingness to pay [WTP], the preferences of that consumer are reflected by the exchange of monetary units for that good. Because the result must be added and analyzed to measure the benefits of the environmental good to society, the individuals WTP is different but the output is to aggregate them to obtain the total WTP (Laurila-Pant, Lehikoinen, Uusitalo & Venesjärvi, 2015; Han, Yang, Wang & Xu, 2011; Pearce & Turner, 1990).

The present study discusses the valuation of an environmental good with consideration of the contingent valuation method [CVM], using WTP. The ecological asset evaluated is the Rio Cocó Ecological Park located in the municipality of Fortaleza, capital of Ceará. According to the State Superintendence of the Environment [*Secretaria Estadual do Meio Ambiente* – SEMACE] (2016), the Rio Cocó Ecological Park has an area of 1,155.2 hectares.

The Rio Cocó Ecological Park is in the process of adaptation to the National System of Conservation Units (NSCU), Federal Law 9985 of July 18, 2000, with proposal of denomination of Cocó State Park. Its creation aims to protect and conserve existing natural resources in order to recover and maintain the ecological balance necessary for the preservation of terrestrial and aquatic biota and to provide conditions for education, recreation, ecotourism and scientific research activities (SEMACE, 2016).

In this context, we outlined the following research question that led to the development of this study: What is the willingness to pay of Rio Cocó Ecological Park visitors to keep the park preserved and conserved? In order to answer this research question, this study aimed to verify the willingness to pay of visitors of Rio Cocó Ecological Park to keep it preserved and conserved. Specifically it aimed to detect from the WTP how much people are willing to pay to enjoy the park and to delineate the profile of these visitors.

This is a descriptive study in terms of its objectives and is quantitative in its approach. A logistic regression model [logit] was used in order to identify which variables influence the existence or not of WTP by the park visitors. The data collection was primary and conducted through a survey which collected 159 visitor questionnaires from the Cocó Park composing the sample of this study. The instrument of collection was elaborated based on the study of Vasconcelos (2014).

The study is justified by the importance of natural resources being estimated, making it possible to provide competent bodies and decision makers with mechanisms that serve as a basis for the implementation of conservation and preservation policies for natural and environmental resources (Portugal Júnior, Portugal & Abreu, 2012). In addition, the estimated value of environmental assets can serve as a parameter to determine the value of fines for damages to the environment (Finco et al, 2005). Finally, we must mention the importance of

this study to enrich the discussion about the application of environmental valuation methods in ecological parks.

## 2 LITERATURE REVIEW

In this section it is discussed the fundamentals of economic valuation of an environmental good, the methods used while emphasizing the application of the contingent valuation method and previous studies that used the valuation methods.

### 2.1 Fundamentals of Economic Valuation

The growing interest of society in environmental issues reflects the consequences of the degradation provoked by accelerated production. It is, therefore, the concerns and articulations of the different social spheres, the result of the change of conception with regard to the relations between man and nature. In addition, this situation provokes a reflection on the directions and how the use of natural resources has occurred (Oliveira, 2016).

In this perspective, neoclassical microeconomic theory focuses on welfare theory which involves the concept of efficiency based on the fundamentals that individuals are considered judges of their decisions and determiners of their preferences. Well-being exists when there is the possibility of reallocating goods and resources so as to increase the usefulness of one individual without diminishing the usefulness of another (Araújo, 2013).

According to Winpenny (1995), individuals aim to maximize their usefulness, strive towards well-being and thus make rational decisions that take into account the inherent constraints of their budget. Such behavior may be related to the attribution of values to goods of which environmental ones are included. They are goods that are part of the utility function of the individuals once the use of them represents consumption.

Economic studies on the use of environmental resources have sought solutions for optimal use so that externalities in the consumption and production of goods and services are eliminated. The difficulty arises when there is no price for these resources in the market, although there is an economic value that can be attributed to consumption that generates welfare to society (Araújo, 2013).

According to Motta (2011), the economic valuation of an environmental resource consists of determining how much better or worse will be the welfare of people due to changes in the quantity of goods and environmental services whether in the appropriation for use or not. Thus, environmental goods and services are attributed values comparable to those attributed to man-made goods and services transacted in the market (Beuren & Souza, 2014).

Nogueira, Medeiros and Arruda (2000) explain that environmental economic valuation methods are used to estimate the values individuals assign to environmental resources based on their individual preferences. Therefore, these methods act as mechanisms that can contribute to the conservation and sustainable use of environmental resources through the capture of plots that can make up the economic value of the environmental resource (Fonseca, Lima, Rezende, Santos & Nazareth, 2013).

Regarding the classification of environmental valuation methods, Nogueira et al. (2000) explain that there is no universally accepted classification of environmental economic valuation techniques. For example, Dlamini (2012) and Maia (2002) distinguish the valuation methods in direct and indirect. Direct methods seek to capture people's preferences by using hypothetical markets or complementary goods markets to obtain individuals' WTP for the environmental good or service. In turn, indirect methods seek to obtain the value of the resource through a production function relating the impact of environmental changes to products with market prices (Laurila-Pant et al., 2015; Han et al., 2011).

Faced with the possibility of economically valuing environmental resources, the question arises as to which method is most appropriate. This is because there is no consensus

about the methodologies commonly used in terms of their efficiency to fulfill their intended purpose, and thus, no valuation methodology has been fully accepted (Falco, Vellasco, Lazo, Altaf &Troccoli, 2013; Nogueira et al., 2000).

The methods of environmental economic valuation are analytical mechanisms. Although there are limitations, the calculated monetary values can be useful tools related to the decisions of public policies. The confrontation with alternative applications allows the selection of projects that present greater potential for social welfare enhancement (Han et al., 2011; Nogueira et al., 2000). Therefore, when deciding on one of the methods, one must take in consideration aspects such as the validity of the observed results, the consequences of the reliability of the estimates and the degree of certainty and identification of the biases involved (Nogueira et al., 2000).

According to Falco et al. (2013) there are three methodologies that stand out in the environmental assessment. The Contingent Valuation Method [CVM], the Travel Cost Method [TCM] and the Hedonic Price Method [HPM]. CVM depends on a hypothetical market simulation. Questionnaires are used that extract from the interviewee the WTP to maintain the current availability of environmental resources and also obtains with this method the willingness to receive [WTR] which allows a reduction in the amount of natural assets (Laurila-Pant et al., 2015, Falco et al., 2013, Han et al., 2011). TCM takes into account the demand for a given activity of a given region and the costs incurred by the visitor to enjoy the benefits of this resource (Tourkolias, Skiada, Mirasenedis & Diakoulaki, 2015; 2011; Motta, 1997). HPM uses property prices as a parameter for the value of the natural assets of a given locality. The price of the property is proportional to the value of the environmental attributes that surround the considered property (Kanojia & Jadhav, 2016; Souza, Ávila & Silva, 2007).

The characteristics of the CVM are the most appropriate to be used in function of the objective proposed in this study. It should be noted that as with any method, its use has advantages and disadvantages. It is the only one that captures values of the existence of environmental goods and services and is adaptable to most environmental problems (Laurila-Pant et al., 2015; Barbisan et al., 2009).

## 2.2 Contingent Valuation Method

The Contingent Valuation Method [CVM] seeks to estimate the WTP and WTR values based on hypothetical situations that simulate the change in the availability of the evaluated object (Mota, Burstzyn, Cândido Júnior & Ortiz. 2010). The willingness to pay can be understood as the maximum amount that the person would be willing to pay for an increase in the provision, or to avoid the deterioration of a good (Laurila-Pant et al., 2015; Falco et al. 2013; Han et al., 2011). The willingness to receive, in turn, means the minimum amount that the person would be willing to receive to be compensated for accepting a decrease in the provision or the deterioration of a good (Maia, 2002; Maia and Romeiro, 2008).

WTP or WTR are obtained through the application of a survey in order to measure values applied in samples of the population seeking to infer them in monetary terms from the hypothetical market proposal (Mota et al., 2010). According to Carvalho Júnior, Marques and Freire (2016), the willingness to pay or to receive can be captured in different ways (Figure 1):

| Free throws (open form or open-ended) | Openly the researcher questions the subject about how much he is willing to pay for the environmental good or service. The individual responds whether or not he/she is willing to pay and, if so, how much. |
| Auction Games (bidding games) | The interviewer negotiates the values, giving suggestions as to how much the respondent would be willing to pay or to receive. |
| Payment cards | The researcher will give a card to the respondent and will question what amount on the card is the maximum they would be willing to pay or the minimum they would be |

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| | willing to receive. |
| Referendum | The interviewer asks if the individual would be willing to pay an "x" value where the amount "x" is systematically modified throughout the sample to evaluate the frequency of responses given to different bid levels. |

**Figure 1.** Ways to estimate the willingness to pay or to receive
Source: Based on Carvalho Júnior, Marques and Freire (2016).

There are some obstacles that the researcher faces in using environmental valuation methods such as the validity of the results obtained, the consequences of the reliability of the estimates, the degree of certainty, and the biases. The contingent valuation method has become used because of its ability to estimate the total economic value of an environmental good or service (Han et al., 2011; Nogueira et al., 2000).

According to Fontenele (2007, 2008), the main benefit of using this method is the monetization of goods that could not have their estimated value otherwise. With the intention of solving market failures, the results are performed with personal assessments on the amount that would be paid as the quality and / or quantity of a natural resource or resource increases or decreases.

To calculate the total willingness to pay or to receive, the willingness to pay (receive) average is multiplied by the population affected by the change in the availability of the good (Motta, 1997). This is the simplest way of aggregating individual preferences.

Obara (1999) and Morgado, Abreu, Réquia & Aravéchia (2011) confirm this idea by stating that total WTP values can be obtained through the product of the number of individuals in the population by the average of WTP values of the sample. TWTP can be visualized in Equation 1:

$$TWTP = AWTP.P \tag{1}$$

Where:
TWPT= total willingness to pay;
AWTP = average willingness to pay;
P= population.

Regarding the estimation of the willingness to pay, Maia (2002) states that when the form of questioning is of the open type, the estimation of willingness to pay can be constructed from regression that relates the endogenous variable (WTP) to a series of variables exogenous that condition individual preferences such as income and schooling as can be seen in Equation 2:

$$WTP = X\beta_i + \varepsilon_i \tag{2}$$

Where:
WTP = willingness to pay in an open type;
X = matrix of independent variables observations;
$\beta_i$ = coefficient vector;
$\varepsilon$ = error normally distributed, with mean 0 and variance $\sigma^2$.

When the endogenous variable is a dichotomous variable, it is not possible to use classical linear regression models. It is more feasible to use other statistical models such as linear probability models, like Probit and Logit (Fontenele, 2007).

According to Fávero, Belfiore, Silva & Chan (2009) a model is defined as logistic [Logit] if the function is represented by Equation 3 and 5:

$$f(Z) = \frac{1}{(1 + e^{-Z})} \tag{3}$$

$$Z = \ln\left(\frac{p}{1-p}\right) = \alpha + \beta_1.X_1 + \beta_2.X_2 + ...+ \beta_k.X_k \tag{4}$$

Where:

p= probability of occurrence of a particular event of interest;

X= matrix of independent variables observations;

α e β₁ = model parameters

Substituting Equation 4 into Equation 3, we have:

$$P(Y)= f(Y|X_1, X_2, ..., X_k) = \frac{1}{(1+ e^{-(\alpha + \beta i.Xi)})} \tag{5}$$

If the use of a cumulative density function is required to explain the behavior of a dichotomous dependent variable, then it is more appropriate to use the Probit model (GUJARATI, 2000), represented by Equation 6:

$$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} \exp\left(\frac{-1}{2} x^2\right) dx \tag{6}$$

In view of the above, it is verified that the use of CVM is a flexible method and adaptable to different situations enabling the capture of the existence value of environmental resources (Motta, 1997).

The next section presents research that has already made use of the contingent valuation methodology.

## 2.3 Previous Studies

Some studies have already been carried out in Brazil in order to apply environmental valuation methods. These studies make it possible to discuss the targeting of funds for activities that provide a greater benefit to the population, thus optimizing the allocation of public resources. Figure 2 shows some previous studies on the subject.

| Author | Objective | Methods | Results |
|--------|-----------|---------|---------|
| Morgado et al. (2011) | Evaluate the WTP for the use of the Ecological Park in Águas Claras, Federal District. | CVM - WTP | The results showed that 57% of Park users are willing to pay for maintenance, conservation and recovery with R $ 11.59 per month. The estimated value for the maintenance of the Águas Claras Park's functions corresponds to R$ 2,503,384.62 per year. |
| Resende, Fernandes, Andrade and Neder.(2011) | Calculate the monetary value of the benefits provided by the Serra do Cipó National Park, state of Minas Gerais, Brazil. | CVM - WTP | It was verified that the value attributed by the visitors of the region corresponds approximately to R$ 716,000.00 per year and that the variables per capita income, number of dependents, level of interest for themes related to the environment and city of origin significantly influenced the decision between being willing to pay or not for the conservation of the Park. |
| Santos, Wakim, Magalhães, Silva and Veiga.(2012) | Identify with the population of Malacacheta, MG, the willingness to pay for the recovery of the Stream of the Indians. | CVM | It was verified that 15% of respondents were willing to pay an average of R$ 43.07 to recover the Stream of the Indians, generating R$ 117,458.35 per month and total revenue of R$ 1,409,500.20. Of the total number of respondents, 85% said they would pay nothing since they understand that it is the responsibility of the government to recover the stream. |

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| Justo and Rodrigues (2014) | Measure the willingness to pay for the creation of the Fundão Site Park and for the recovery and preservation of its green area and historical cultural heritage. | CVM | The results pointed out that age, schooling, family income, and leisure spending increase the probability of willingness to pay differently from unmarried respondents. It has been observed that men are less willing to pay and that the aggregate values exceed the value invested by the government of Ceará indicating that the policy of creating the park is to increase the well-being of the population. |
| Costa, Souza, Ribeiro and Pasa(2015) | Analyze which approaches to the contingent valuation method best minimizes the responses of protests to spontaneous and induced payables. | CVM | The results showed that free throws presented lower percentages of unwillingness to pay while the referendum obtained a better result in minimizing protest or void responses. |
| Brandli, Prietto and Neckel (2015) | Check the willingness of the population of Passo Fundo to pay for improvements, maintenance, and conservation of a park located in the subdivision University City. | CVM - WTP | An economic value was obtained between R$ 964,560.00 and R$ 2,531,970.00 for improvement, maintenance, and conservation of the park. In addition, a relationship was found between the socioeconomic characteristics of the population and the willingness to pay. The analysis of the economic viability for investments in this park showed a positive net present value. |
| Carvalho Júnior et al. (2016) | Apply valuation methods to obtain the economic value of Memorial Darcy Ribeiro known as Beijódromo located in Brasília. | CVM and TCM | The value found in the CVM does not differ from that found by the CVM. The economic estimate is much lower than that invested in the construction of the Memorial. The lack of adequate information on the origin and the number of visitors and tourists influenced the result. |

**Figure 2:** Previous empirical studies
Source: Prepared by the authors.

Castro (2016) developed a survey of the research that applied the MVC. It found that 26.44% of the works refer to parks which is little compared to the number of 71 national parks, 221 state parks and several municipal parks (MMA, 2016). In relation to the protected areas, only 14.94% of the studies deal with these areas, taking into account that there are 519 areas at the national level (Viana & Ganem, 2005).

Also in Castro's study (2016), it was observed that only 4.4% of the CVM studies deal with natural national monuments, biological reserves, conservation units, and others. Only 23% of hydrographic regions were part of the research to discriminate other types of such as environmental assets (air, garbage, museums, memorial, and others). It was verified that 28.73% of the studies were dedicated to these assets. The study concludes that before the Brazilian territorial extension there are innumerable assets to be valued.

Castro (2016) argues that CVM has fifty years of use in studies and is still a relatively new area in Brazil, and that the studies already developed have served to provide a strong theoretical and empirical basis although there is room for refinements.

**3 METHOD**
This section presents the method used to develop this research covering the study area, the characterization and construction of the sample, the econometric model, and the variables used.

## 3.1 Study Area

The research approaches the willingness to pay for the use of Rio Cocó Ecological Park located in the city of Fortaleza, state of Ceará. The Cocó River is part of the basin of the rivers of the east coast of Ceará. It has a watershed of approximately 485 km² and the main river has a total length of about 50 km (SEMACE, 2016).

This park was created with the objective of protecting and conserving the natural resources in it. In addition, the aim was to restore ecological balance for the preservation of animal and plant species (terrestrial and aquatic), and the possibility to create conditions for ecological tourism, sports, environmental education, leisure and scientific research activities. This provides the direct contact of the population with the natural environment, inserting it into actions of preservation and control (SEMACE, 2016).

In the Park, there are three areas available for leisure, sport and culture. The first area is the Ecological Park of Cocó, the second area is the Adhail Barreto Park with an area managed by the Municipality of Fortaleza, and the third area is a leisure pole named Tancredo Neves (SEMACE, 2016).

Among the permanent services in the park, there are the services of recovery, conservation, and maintenance of the park with the monitoring of 07 points of degradation of the river Cocó, including the main contributors. The following activities are examples of activities that were carried out in the park: (i) ecological footpaths; (ii) the recovery of equipment and furniture in the park; (iii) the delimitation "in loco" of the area of Rio Cocó State Park; among others (SEMACE, 2016).

The public visitation in the Cocó Ecological Park is allowed since it is related with activities focused on environmental education, leisure, scientific research and social events. In the case of group visits, monitors are available provided it is previously scheduled. As for the number of visitors to the park, 18,000 visitors were registered in the first half of 2015. In the same period of 2016, this number changed to almost 23,000 visits, a growth of 28% (SEMACE, 2016).

## 3.2 Research Procedures

This study is descriptive because it outlines the information about the sample and the willingness to pay for the use of Cocó Ecological Park. It is quantitative because it focuses on the measurement of phenomena involving the collection and analysis of numerical data using statistical methods (Collis & Hussey, 2005).

To answer the objective of this research, Contingent Valuation Method [MVC] was used with estimation of the WTP values. We used primary data obtained through the application of questionnaires. The questionnaire was elaborated based on Vasconcelos (2014) in which the profile of the respondents can be identified, such as gender, income, schooling. Aspects related to the preservation and conservation of the natural landscape and park leisure areas, visits to the park, number of annual visits and willingness to pay.

The questionnaire was applied in two stages. The first stage was a pre-test with a pilot instrument and the application of the questionnaires in its final version. In the pre-test, the questionnaires were applied to 20 individuals in order to test the quality and level of clarity of the questions. In the second stage, the questionnaire was adjusted and some information was inserted to promote the clear understanding of the questions by the survey respondents.

The minimum sample size (n) was defined by Equation 7 where z is the table value for significance level of 5%, p is the success ratio, $\varepsilon$ is the tolerated sample error, and N is the population. For this work, the values of z, p, and $\varepsilon$ will be respectively (1.96), (0.5) and (0.08) (Stevenson, 2001). The number of 23,000 visits that took place in the first half of 2016 were considered as the population for this study. Thus, the minimum sample size was 149 questionnaires.

$$n = \frac{N \cdot \frac{z^2 p\,(1-p)}{\varepsilon^2}}{N + \frac{z^2 p\,(1-p)}{\varepsilon^2}} \qquad (7)$$

Some criteria were adopted for the questionnaires treatment. Initially 176 questionnaires were applied. After analysis, it was observed that there were 17 invalid questionnaires. Among the problems that invalidated the questionnaires, the most recurrent was incompatible answers with certain questions that allowed open answers. Thus, the sample consisted of 159 questionnaires which is within the minimum limit established by the sample size.

Afterwards, descriptive statistical analyzes of the sample profile were developed aiming at delineating the main characteristics of the visitors of Rio Cocó Ecological Park. In order to identify the probability of the individual to be willing to contribute for park conservation, a non-linear regression based on the cumulative logistic probability function was used. This non-linear regression is known as Logit model (Fávero et al., 2009). This model is often used in binary choice situations where the dependent variable can assume only two values. In this research it is associated with WTP and can assume 1 for the individual who is willing to pay and 0 for the one who is not.

Thus, the study adopts the model represented in Equation 8.

$$WTP = \alpha + \beta_1 LnINCOME + \beta_2\ PRESERV + \beta_3\ CONSERV + \beta_4\ TIME + \beta_5 VISIT + \beta_6 DEP + \beta_7 SCHOOLING + \beta_8 GEN + \beta_9\ LnAGE + \beta_{10} SPENDING + \beta_{11} IMPORT \qquad (8)$$

| Variável | Descrição |
|---|---|
| WTP | 1 if the person is willing to pay per visit, in reais, otherwise 0; |
| INCOME | Average value of income; |
| PRESERV | Score (1 to 10) attributed to the state of preservation of Cocó Ecological Park; |
| CONSERV | Score (1 to 10) attributed to the state of conservation of Cocó Ecological Park; |
| TIME | Time spent in the park; |
| VISIT | Number of visits; |
| DEP | Dummy variable: 1 if the person has dependent(s), otherwise 0; |
| SCHOOLING | 1, if in elementary school; 2, if finished elementary school; 3, if in high school; 4, if finished high school; 5, if at university/college ; 6, if finished university/college; 7, if holds a *lato sensu* postgraduate; 8, if has a master's degree; e 9, if has PhD; |
| GEN | Dummy variable: 1 if female, 0 if male; |
| AGE | Age. |
| SPENDING | Amount spent to visit the park; |
| IMPORT | Degree of importance attributed to the preservation and conservation of the park. |

**Figure 3.** Description of variables.
Source: Prepared by the authors.

To perform the tests, the following statistical software were used: *Statistical Package for the Social Sciences* (SPSS), in version 22.0; and STATA – *Data Analysis Statistical Software*, in version 14.0.

## 4 RESULTS AND DISCUSSION

Initially a descriptive analysis of the data was carried out in order to observe how the research variables compose the profile of the respondents as it can be seen in Table 1.

Table 1
**Descriptive statistics of the variables used in the model.**

| Variable | WTP | SPENDING | PRESERV | CONSERV | GEN | DEP | VISIT | TIME | SCHOOLING | IMPORT | AGE | INCOME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **N** | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 |
| **Minimum** | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 1 | 3 | 4 | 16 | 880 |
| **Maximum** | 1 | 150 | 10 | 10 | 1 | 1 | 5 | 5 | 9 | 10 | 62 | 9681 |
| **Mean** | 0,58 | 18,55 | 7,44 | 9,47 | 0,64 | 0,25 | 2,09 | 2,04 | 6,05 | 9,7 | 29,69 | 3669,9 |
| **CV (%)** | 84,51 | 124,97 | 28,83 | 13,33 | 76,02 | 175,97 | 69,29 | 46,49 | 20,01 | 9,9 | 33,44 | 79,92 |

**Note.** Source: Research data.

Regarding the WTP, which is a dummy variable, 1 means that there is willingness to pay by the respondent and 0 there is no willingness to pay. It was observed that the value of the mean is 0.58, in other words, 58% of the respondents are willing to pay for the use of the park.

In relation to the amount spent in Cocó Park per visit (SPENDING), it is possible to verify that on average people spend R$ 18.55 per visit. In addition, it is verified that some respondents do not make any expenses to visit the park as well as registered a maximum spending of R$ 150. Based on the value recorded by the coefficient of variation, there is a high level of heterogeneity in the responses of the individuals questioned.

Regarding the level of the environmental preservation status attributed by the respondents (PRESERV), it can be observed that on a scale of 1 to 10 the average obtained among the individuals questioned was 7.44. The coefficient of variation reveals that there is a medium dispersion between the responses. Regarding the level of environmental conservation status attributed by the respondents (CONSERV), a mean of 9.47 was found in the responses where the scale also varied from 1 to 10. In relation to the coefficient of variation, it was observed that there were homogeneity responses on the state of environmental conservation. In general, it is verified that the respondents attribute a higher note to the state of conservation than to the state of environmental preservation of the park.

Relating to the gender of the respondents (GEN), it can be observed that the value obtained through the mean of the answers (0.64) exceeded the median pointing out that there was a greater number of respondents who identified themselves as being of the gender female. The sample is made up of 64% of people who identify with the female gender and 36% who identify with the male gender. Regarding the existence of dependents of the questioned individuals (DEP) which is also a dummy variable, where 0 means that the individual has no dependents and 1 that the individual has dependents, it was observed that the value obtained through of the mean of the responses was lower than the median showing that only 25% of respondents have dependents.

Regarding the variable related to the number of visits that the respondent makes to the park per year (VISIT), it was verified that on average the individuals that compose the sample make 2.09 visits to the park per year. The criterion of inclusion in the sample is based on the minimum of one visit per year. Regarding the time spent by the respondents during each visit to the park (TIME) it was observed that on average the individuals questioned spent 2.04 hours in each visit. The minimum time spent is 1 hour and the maximum time is 5 hours.

According to the results related to the level of schooling of the individuals (SCHOOLING), it was possible to observe that the lowest level registered was number 3 (respondent in high school) while the highest level was number 9 (respondent with PhD). The coefficient of variation reveals that there is moderate level of dispersion in the responses.

Regarding the degree of importance attributed by the respondents to the conservation and preservation of the park (IMPORT), a mean of 9.70 was found on a scale ranging from 1 to 10, meaning that, in general, people who were questioned attach a high degree of importance to the conservation and preservation of the park. Moreover, based on the coefficient of variation it can be stated that there is homogeneity among the answers on this topic.

Regarding the age of the respondents (AGE), it was observed that the youngest individual in the sample is 16 years old while the oldest is 62 years old. The average age of individuals is 29.69 years old and coefficient of variation reveals heterogeneity in relation to the age of the respondents. Regarding the income variable (INCOME), it was verified that there are individuals with income of up to a minimum wage (R$ 880) as well as individuals with income above 11 minimum wages (R$ 9,681.00). The average salary of respondents is R$ 3,669.00. According to the coefficient of variation there is a high variability of the data evidencing heterogeneity among the responses.

After presenting the profile of the sample it is time to present the results related to the Logit model in order to identify which variables influence the WTP.

Table 2
**Estimation of the Logit model.**

| Variable | INCOME | SPENDING | PRESERV | CONSERV | AGE | GEN | DEP | VISIT | TIME | SCHOOLING | IMPORT | CONST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coef. | .0093 (*) | .0001 | -.0005 | -.0042 (**) | -.006 | .0063 (**) | .0102 (**) | -.0016 | .0011 | -.0050 (*) | .0022 | -.4052 |
| P-Value | .002 | .32 | .598 | .094 | .451 | .1 | .057 | .213 | .596 | .005 | .405 | .911 |
| Efect Marg. | .0022 (*) | .0001 | -.0001 | -.0009 (**) | -.0014 | .0015 (**) | .0024 (**) | -.0003 | .0002 | -.0011 (*) | .0005 | |

Number of obs. = 159. LR chi2(11) = 32,62. Prob > chi2 = 0,0006. Pseudo $R^2$ = 0,1512. Correctly sorted values= 69.18%. Y=Pred(y) = 61%.
**Note.** (*) Significant at 1%; (**) significant at 10%. Source: Research data.

In Table 2 it is presented the logit model estimation considering the whole sample. The variables "spending", "preservation", "age", "number of visits", "time spent in the park" and "importance of the park" were not significant. Other variables such as "income", "conservation", "gender", "dependents" and "schooling" presented significance. Considering the coefficients statistically significant, only those of "income" and "schooling" were significant at 1%, and the others at 10%. "Income", "gender", and "number of dependents" increase the likelihood that the individual will be willing to pay to visit the park, and "schooling" and "conservation" will reduce the likelihood of willingness to pay.

Regarding the significance of the gender dummy coefficient, it is indicated that there are differences between men and women in the willingness to pay for the use of the park. The same can be inferred by the number of dependents suggesting that the increase in the number raises the probability to pay by 0.24%. Thus, the increase in the number of members that depend on income also leads to an increase in the probability of the individual presenting with WTP. In this way, individuals who are part of larger families are more willing to contribute to the conservation and preservation of the park. This result is in line with that found by Resende et al. (2011) that points out as a possible explanation the concern of individuals to ensure a better quality of life for their families in the future.

The marginal effect on the variable "income" indicates that for an increase of R$1, the probability of individuals accepting to pay increases in 0.22%. Thus, the increase in per capita income has a positive influence on the probability of the individual presents WTP. That

suggests individuals with higher incomes have greater ability to pay and are more willing to give up a portion of their income to ensure the preservation and conservation of Cocó Park. This result corroborates the findings of Justo and Rodrigues (2014), Vasconcelos (2014) and Corbeti, Alvim and Dias (2010).

In turn, each increase in schooling rates reduces the probability of accepting to pay to use the park in 0.11%. The influence of the schooling variable on the WTP observed in this study corroborates the study of Justo and Rodrigues (2014) and contradicts the research by Corbeti et al. (2010) who indicated in their study that the willingness to pay of the interviewees is not influenced by their level of education.

The increase in the perception of conservation in the park reduces the probability of payment in 0.09%. There is a significant and inverse relationship between this variable and the WTP indicating that the greater the value attributed to this aspect, the less willingness to pay for the conservation/preservation of Cocó Park. One possible explanation would be that the interviewees believe that there is no need for the population to pay for a service that is already in compliance with what was expected.

It can also be emphasized that, although not statistically significant, the number of visits reduces the probability of willingness to pay where the number of visits is inversely proportional to the willingness to pay.

The model explains approximately 15.12% of the willingness to pay. Thus, the variation of the dependent variable can be explained by the variation of the dependent variables of the model. Also, the amounts are correctly classified in a percentage of 69.18% and the probability of willingness to pay for this specific sample is 61%.

To measure the value that respondents willing to pay would disburse to use the park, it was considered that only 58% of the 159 respondents were willing to pay. Thus, in absolute value 92 individuals were willing to pay some value for the use of the park.

Thus, according to the given bids, an average WTP of R$ 11.53 per visit to Cocó Park was verified, it can be seen in Table 3.

Table 3
**Average amount of the willingness to pay.**

|  | N | Minimum | Maximum | Mean | Standard Deviation | Coefficient of Variation |
|---|---|---|---|---|---|---|
| **A-WTP** | 92 | 1 | 100 | 11.53 | 14.18 | 123% |

**Note.** Source: Research data.

It can be seen from Table 3 that the lowest bid was R$ 1 and the highest was R$ 100, and a high variability in relation to the values presented, which suggests that individuals willing to pay for the conservation and preservation of the park have different perceptions.

González (2005) presented, in his research an average WTP of R$ 14.53 per month to visit the Phillipe Westin Cabral de Vasconcelos Park, in the Luiz de Queiroz College of Agriculture of the University of São Paulo. Morgado et al (2011), when verifying the average WTP to visit the Águas Claras Multipurpose Ecological Park found a value of R$ 11.59 per month.

Considering that SEMACE estimates that in the first half of 2016 the number of visits to the Rio Cocó Ecological Park was approximately 23,000, the monthly average is approximately 3,833 visitors. Using the method proposed by Obara (1999) explained in section 2.2, and considering the average WTP of R$11.53 per person, the value of use of the park corresponds to R$44,194.49 per month or R$265,166.94 per semester. This value could be used for the maintenance conservation and preservation of the park.

## 5 CONCLUSIONS

The literature on economic valuation methods is based on the fact that environmental resources generate benefits that may reflect the general well-being of the population. Therefore, estimating the value of an environmental good can serve as a basis for the creation of environmental policies that focus on preservation and conservation (Finco et al., 2005).

In this context, this work aimed to verify the willingness to pay of visitors ofRio Cocó Ecological Park to keep it preserved and conserved. For this purpose, Contingent Valuation Method [CVM] was used with estimation of WTP values.

The number of 23,000 visitors who visited the Park in the first half of 2016was considered as population – this data was released by SEMACE. Regarding the sample, 159 questionnaires of respondents who visited the park in the last year were considered. For data treatment, descriptive statistical analysis, logistic regression, and the calculation of the average WTP based on Obara (1999) were developed.

In order to answer to the general objective, it was verified that 58% of the respondents are willing to pay to visit Cocó Ecological Park. Regarding the sample profile, the data showed the following characteristics: 64% of the respondents identify themselves with the female gender; 25% of the respondents have dependents; the average number of visits to the park is 2.09 visits per year; the average age is 29.7 years old; and the average salary of the respondents is R$3,669.00.

According to the Logistic Regression, the variables "spending", "preservation", "age", "number of visits", "time" and "importance" were not significant. The variables "income", "conservation", "gender", "dependents" and "schooling "presented significance. "Income", "gender", and "dependents" significantly increase the likelihood that the individual will be willing to pay to visit the park. "Schooling" and "conservation" significantly reduce the likelihood of willingness to pay. There was also an average WTP of R$11.53. This is the average value that respondents willing to pay were willing to disburse to use the park.

It is concluded that the majority of visitors are willing to pay to use the park in exchange for improvements in the preservation and conservation, and those visitors would be willing to pay an average value of R$ 11.53.

The research has as limitations the absence of an exact number of the population since it was considered an estimated half-yearly figure. For future studies, it is suggested an analysis of the externalities caused by the existence of the park and how they may impact the value of this resource.

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