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# Understanding the Willingness to Pay for Ecotourism Services in Natural Waterfall Areas: An Empirical Study in Casanare, Colombia

## Abstract

This study aims to determine visitors' willingness to pay (WTP) for ecotourism services in the La Algarroba waterfall in Monterrey, Casanare, Colombia. We chose this location because it is part of a green corridor with a high potential for ecotourism. We estimated the willingness-to-pay (WTP) using the double-bounded dichotomous choice contingent valuation method. Our findings reveal that visitors participate more in ecotourism when they understand the flow of ecosystem benefits, when more income is generated for local communities, and when they have a higher opinion of public safety in the area. The latter is significant after the Colombian peace treaty.

*Keywords:* ecotourism, sustainability, contingent valuation method, willingness-to-pay, ecosystem services

## 1. Introduction

Due to its geographic, hydrological, and climatological conditions, Colombia is characterised by its rich natural wealth, ranking third in the world for biodiversity as of 2022 (Sistema de Información sobre Biodiversidad de Colombia [SIB], 2022; WorldAtlas, 2022). These characteristics demonstrate significant potential for natural resources, biodiversity, and nature-based tourism services. Correspondingly, the Colombian Orinoquía region is highly ecologically diverse, which gives this area a high potential for tourism development. However, historically, most of the natural wealth of this region has not been adequately utilized due to a lack of knowledge, abandonment, and underutilization of natural attractions, as well as the dominance of productive activities such as mining, oil and gas extraction, agriculture, and extensive cattle ranching.

In 2012, the Tourism Promotion Fund in Colombia published tourist guides for the departments of Meta and Casanare (Ministry of Commerce, Industry, and Tourism, 2012a, 2012b), which identified attractions in each municipality with their location and characteristics. However, the country's lack of knowledge about its natural wealth, in terms of biodiversity and landscape, persists. This, in addition to the public safety issues that have historically affected these areas, has discouraged the country's regions from using their natural wealth for development. Such has been the case for the region between the Casanare and Guayabero rivers. Ecotourism as an approach can promote the conservation and preservation of nature's assets, contributing to the valuation and better utilization of natural resources. Thus, to encourage this economic activity in the

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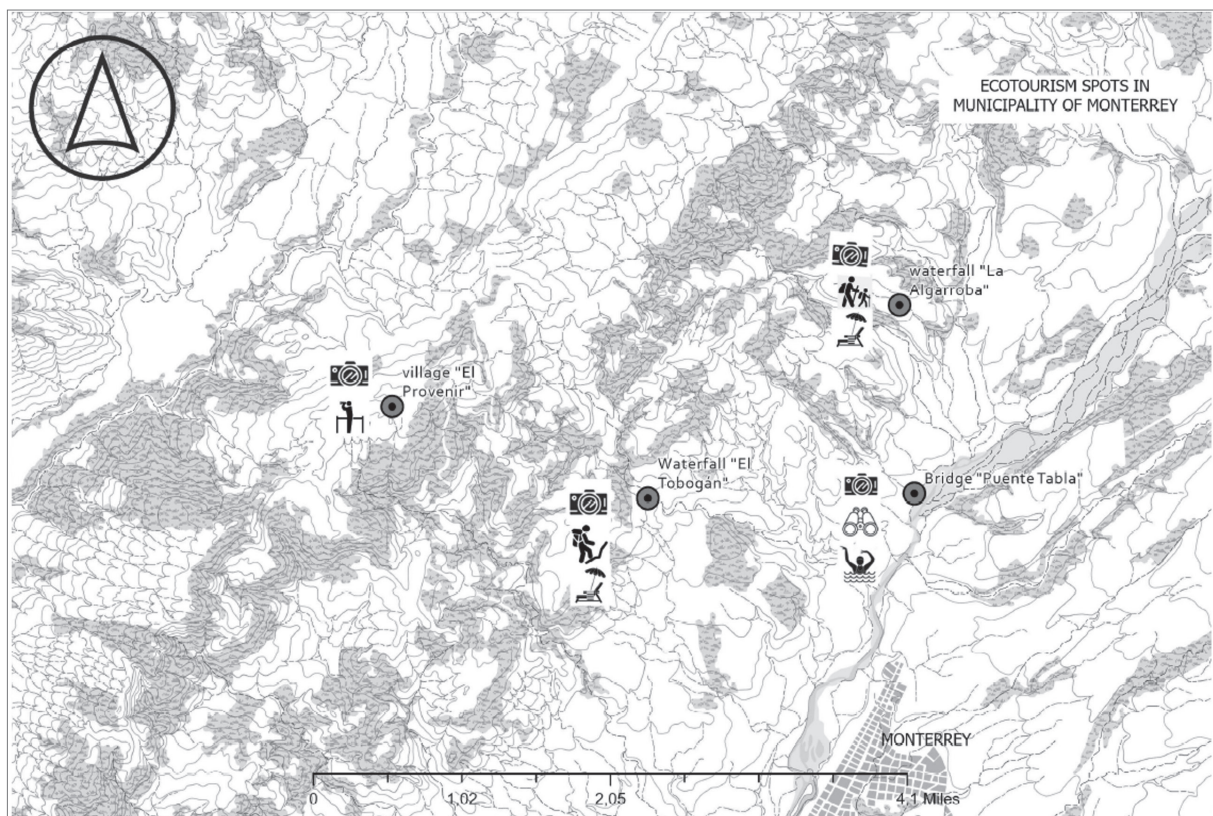
country's plains-rainforest Piedmont, a strategy must be designed based on the recognition, diagnosis, and generation of tourist attractions (Acosta et al., 2017).

The study area corresponds to the municipality of Monterrey due to its importance as part of the plains-rainforest piedmont in the city of Tame in the department of Arauca and the Serranía de La Macarena in the department of Meta. This ecological corridor presents a wide variety of natural attractions whose ecotourism potential has been ignored, partly because of the predominance of traditional productive agriculture, livestock farming, and natural resource extraction activities and because of the historical impact of the internal armed conflict that made ecotourism impossible before the signing of the peace treaty in 2016.

To evaluate the ecosystem services of regulation, sustainability, and sociocultural aspects, as well as the degree of sensitivity and resilience, the "La Algarroba" cascade was prioritized as a study node.

This is because the node is a natural reserve area that provides water boasts a scenic landscape, features natural pools, and serves as an ecological corridor with the most significant ecotourism potential in the area.

**Figure 1**  
*La Algarroba and El Tobogán waterfalls, municipality of Monterrey, Casanare, Colombia*



## 2. Literature review

### 2.1. Ecotourism

Ecotourism is an economic activity that can be categorized within the tourism sector, although it differs in its contribution to sustainability and the principle of benefiting local communities. However, there is no single definition or conceptualization of “ecotourism,” i.e., there is no universally accepted definition (Akinyemi & Mushunje, 2020; Cobbinah, 2015).

Ceballos-Lascurain defines ecotourism as “travel to relatively quiet or uncontaminated natural areas with the specific objectives of studying, admiring, and enjoying the landscape and its wild plants and animals, as well as any axiological cultural manifestations (past and present) found in these areas” (Ceballos-Lascurain, 1996). Fennell defines it as “natural resource-based tourism that focuses primarily on experiencing and learning about nature and is ethically managed to be low-impact, non-consumptive, and locally oriented” (Fennell, 2001, 2003). On the other hand, Holing defines ecotourism as “ecologically sensitive travel that combines the pleasures of discovering and understanding spectacular flora and fauna while contributing to their conservation” (Holing, 2003). Similarly, the International Ecotourism Society understands ecotourism as “responsible travel to natural areas that conserves the environment and sustains the well-being of the local people” (International Ecotourism Society, 2019).

The Colombian Ministry of Commerce, Industry, and Tourism adopted the definition from the International Union for Conservation of Nature (IUCN) for the construction of its Policy for Ecotourism Development in 2003, defining *ecotourism* as “environmentally responsible tourism, consisting of travelling or visiting relatively undisturbed natural areas to enjoy, appreciate, and study the natural attractions (landscape, flora, and fauna) of these areas, as well as any cultural manifestations (present and past) that may be found there, through a process that promotes conservation, has a low environmental and cultural impact, and fosters an active and socioeconomically beneficial involvement of local populations” (Ministry of Commerce, Industry, and Tourism, 2003, p. 16).

In short, ecotourism includes six aspects that must be considered: demand for ecotourism, activities, destinations, infrastructure, ecotourism guides, and the local community, who are the stakeholders in these activities in the form of providing lodging, transportation, and restaurants, among others (Orgaz, 2014), and preserve natural and cultural values for future generations (Williams, 2015). In other words, ecotourism embodies the principles of the three pillars of sustainability (environment, society, and economy) in that it reaches all the aims of sustainability: environmental conservation and education, social equity, and cultural preservation (Brandful, 2015) as well as socioeconomic benefits for the communities (Brandful, 2015; Gurung & Seeland, 2008).

### 2.2. Contingent valuation method

The contingent valuation method (CVM) is commonly used for environmental economic valuation. It values the experienced welfare (if it has already occurred) or the expected welfare (if it is a potential change) due to modifications in some attribute of the environment. In this sense, the CVM establishes use values and non-use values of environmental goods and services (Hackett, 2006). The method is based on collecting primary information from surveys, simulating a hypothetical market by assigning monetary values to environmental goods or services that have no market or are not marketable (Carson, 2000). This technique captures information from respondents about their stated preferences (Azqueta, 2007). With it, we can extrapolate a welfare measure caused by changes in the quantity and quality of environmental goods and services (Haab

& McConnell, 2002a, 2002b; Hackett, 2006; Hanemann, 1999). This welfare measure is expressed in terms of individual *willingness-to-pay* (WTP).

### 2.3. Previous valuation studies

Several approaches are discussed in the literature. For example, Adamu et al. (2015) conducted a study to estimate visitors' willingness to pay (WTP) for the entrance fee to the Yankari Reserve in Nigeria. Using the contingent valuation method with a dichotomous double-bounded approach, the authors found that park visitors would be willing to pay USD\$3.4 for the entrance fee. Moreover, Kaffashi et al. (2015) also employed the contingent valuation method to determine the willingness to pay (WTP) for the entrance fee to the National Elephant Conservation Centre in Malaysia. They made a distinction based on the type of visitor: domestic or foreign tourists. The authors estimated an average WTP value of USD 1.6 for domestic visitors and USD 3.2 for foreign visitors.

Other ecotourism WTP studies present empirical evidence on the validity of different variables as determinants of ecotourism demand, including traditional socioeconomic variables such as age, gender, education level, and income, as well as other determinants specific to tourism demand studies such as the use of guides, the provision of adequate infrastructure, and the degree of environmental knowledge, awareness, and conservation. Studies using traditional demand determinants include works by Hultman et al. (2015), Rodella et al. (2019), and Nie et al. (2019), which employ variables such as age, gender, education, and income to estimate WTP. On the other hand, authors such as Baral et al. (2008) and Schutgens et al. (2018) demonstrated statistical significance through different variables, such as the use of tourist guides, visitor satisfaction, and number of overnight stays in ecotourism destinations or, as do Kamri et al., (2017), use the number of previous visits as an explanatory variable. Other variables employed in WTP studies include the degree of knowledge tourists have on ecotourism and environmental conservation (Lundberg et al., 2019; Sadikin et al., 2017).

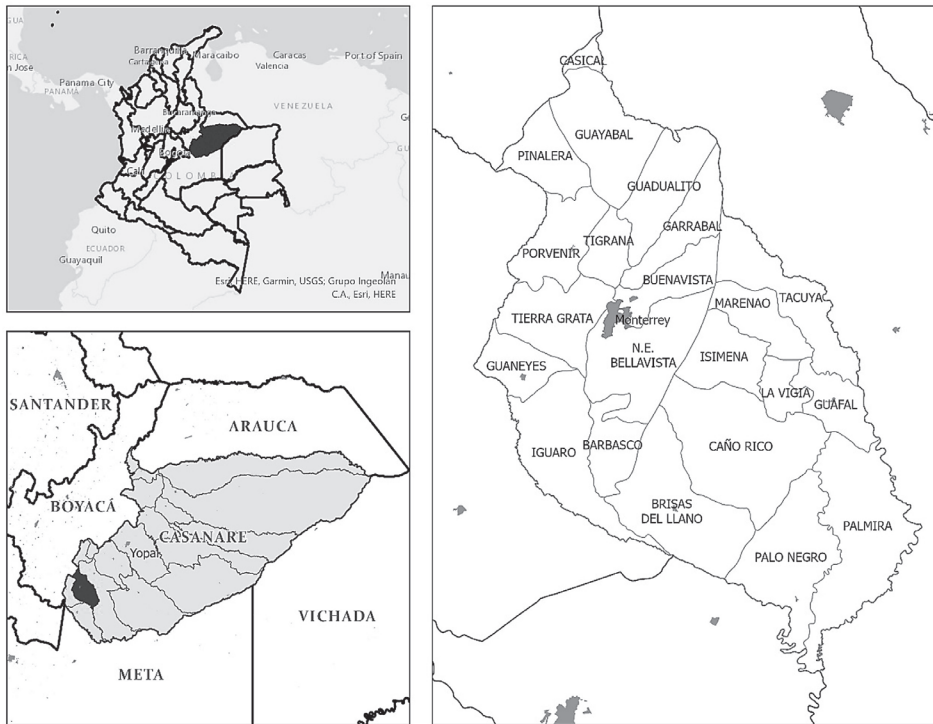
This study employs a combined approach using traditional explanatory variables in tourism demand studies, such as age, gender, and income, while also including alternative determinants, such as ecotourism awareness, which encompasses sensitivity to environmental conservation and the degree of knowledge of ecotourism activities, and security and public order conditions that reflect the visitors' perception of tranquility and security where they participate in ecotourism activities. We aim to estimate the willingness-to-pay (WTP) for ecotourism at the La Algarroba waterfall using these variables.

## 3. Materials and methods

### 3.1. Description of the study area

The area of influence was defined as the municipality of Monterrey (Casanare-Colombia). Within the city, we selected the locality of La Tigrana as the study area because it has several natural locations with ecotourism potential, including the natural pools “Cascada la Algarroba” (La Algarroba waterfall) and “Cascada el Tobogán” (El Tobogán waterfall). They are one of the main natural attractions with ecotourism potential due to their natural reserve areas, which are characterized by their hydrological importance, scenic beauty, and the possibility of connecting them as a green corridor. Figure 2 shows the spatial delimitation of the municipality (with its respective localities) in the piedmont of the Colombian eastern mountain range, 105 kilometers from Yopal, capital of Casanare (Latitude 4° 52' 34" N and Longitude 72° 53' 50" W).

**Figure 2**  
**Municipality of Monterrey, Casanare` State, Colombia**



### 3.2. Description of the natural element valued

The environmental asset valued is La Algarroba waterfall due to its natural appeal and to the ecosystem services identified in the area, such as utilization or provisioning services (e.g., freshwater supply), regulation and support services (e.g., biodiversity and water regulation), socio-cultural services (e.g., recreation and tourism, landscape contemplation, and spiritual connection). The waterfall is located at 4° 57' 40" N and 72° 52' 31" W. It is 770 meters above sea level and 10 kilometers from the municipality of Monterrey. The average temperature is 27°C. Figure 3 shows a general view.

**Figure 3**  
**Natural pools, La Algarroba waterfall**



### 3.3. Survey design

Data collection was done by obtaining primary information. This pre-survey was applied to a group of 62 randomly selected people (tourists and inhabitants) to get initial information on socioeconomic aspects, detect instrumental and non-instrumental biases, define the payment vector and the ideal payment method, and adjust the survey form (Tudela, 2017; Tudela & Leos, 2017; Villena & Lafuente, 2013).

For the pre-survey, we gathered information using a semi-structured interview through a survey designed in four blocks. The first block described the conditions of La Algarroba waterfall. In addition, we presented images of the waterfall as a visual aid to provide information that would enable respondents to learn more about the place's attributes.

The second section presented two scenarios of waterfall conservation and restoration measures in the municipality. It also collected information on the WTP. The third section aimed to collect information on the socioeconomic conditions of the respondents, and the last section collected data on the attitudes and degree of knowledge about the environmental asset to be valued.

In the pre-survey, respondents were also asked about their WTP using an open-response format, allowing them to report the amount they would pay directly, as well as the maximum and minimum amounts they would be willing to offer. After applying the pre-survey and analyzing the results, we adjusted the final instrument. We retained the four-block structure and modified the questions on WTP and the reasons for being unwilling to pay, including several options for protest responses. For the final survey, we also included personal interviews.

### 3.4. Contingent valuation question and treatment of biases

To avoid instrumental biases, we included questions in the pre-survey designed to identify biases related to the starting point, payment method, available information, and the interviewer. We detailed the potential ecotourism services and the socioeconomic benefits of this activity and also included all these aspects to ensure the respondent was sufficiently informed. In addition, as suggested by Johansson (1987, 1990), we included a statement after the WTP questions of the proposed ecotourism services.

Regarding the non-instrumental biases (hypothesis and strategic biases), we presented the respondents with two feasible scenarios for environmental conservation and restoration, as well as the ecotourism services available in the area. We also presented the potential environmental damage that could occur and the likelihood of generating economic benefits without implementing environmental measures or incentives for ecotourism. Additionally, we employed open-ended questions to enable respondents to express their opinions. Thus, we avoided queries that had previously established response categories, thereby reducing the possibility of receiving subjective or insincere responses, which can result from respondents selecting answers they consider socially desirable. We also included follow-up questions to verify the coherence and consistency of the respondents' answers. With the pre-survey results, we conducted an analysis to identify instrumental and non-instrumental biases and minimize them by adjusting the final survey. For instance, we included double-bounded questions to establish the offered payment vector and added the "entrance fee with a single payment per visitor" payment mechanism identified in the pre-survey. Additionally, we ensured concise wording and used clear, understandable, and non-technical language to facilitate respondents' comprehension of the survey and its purpose.

### 3.5. Sample size

To calculate the sample size, we used the population of the municipality of Monterrey, which is 17,797 inhabitants (Departamento Administrativo Nacional de Estadística [DANE], 2022), plus the floating population of

872 domestic and foreign tourists (Ministry of Commerce, 2020). The total population was 18,669 people. The equation used to calculate the sample size was as follows.

$$n = \frac{Z^2 p q N}{NE^2 + Z^2 p q} \quad (1)$$

Where  $N$  = population (18,669),  $Z$  = significance level at 5% (1.96),  $p$  = probability (or percentage) of success (0.50),  $q = 1 - p$ , and  $E$  = maximum permissible error (8%). With the above information, the optimum sample size calculated was 152 individuals. However, it is worth noting that 174 surveys were conducted, of which 167 were deemed valid.

### 3.6. Theoretical reference, empirical strategy, and payment vector

We used Hanemann's parametric utility function model (1989) to quantify Hicksian welfare measures obtained from referendum-type questions. The utility function, which includes the demand for ecotourism services, is as follows (Hanemann, 1989):

$$u_j = u_j(p, y, q_j) + \epsilon_j; \forall j = 0, 1 \quad (2)$$

Where  $u_j$  is the unobservable direct utility function,  $p$  is the payment vector,  $y$  is the income level, and  $q_j$  is the environmental/ecological condition (natural attraction), and  $\epsilon_j$  is the error term to which the utility level is subject. Furthermore,  $j=0$  represents the initial conservation status of the natural attraction, and  $j=1$  denotes the final status after implementing actions to enhance environmental conservation and ecotourism within the natural attraction. However,  $u_j$  is unobservable, so the  $v_j$  indirect utility function must be specified.

The dichotomous choice approach assumes that the respondent's "yes" or "no" response regarding willingness to pay is determined by comparing their declared willingness to pay with the offers presented to them. However, as Diamond and Hausman (1994) point out, this approach can lead to biases and specification problems derived from the starting point of the offered amount, resulting in less efficient and precise estimates of WTP. For these problems, the double-bounded or double follow-up dichotomous format was used. It involves the addition of a second question of a dichotomous nature to enhance the efficiency of the WTP estimates.

Following the approach of Hanemann et al. (1991), an initial offer amount of  $B_i$  was offered to each  $i$  respondent, and a counter-question was asked depending on the first answer: if the individual answered *YES* to the first amount, then they were asked for a higher amount ( $B_i^u$ ); if they answered *NO* to the first question, a lower amount was offered ( $B_i^d$ ), thus obtaining an upper and a lower threshold of the WTP.

The double-referendum dichotomous format selection is based on the ability of this method to provide a gain in the precision of the variance-covariance matrix of the estimated coefficients. It allows us to obtain smaller confidence intervals. In addition, the point estimator of the median of the WTP is generally smaller (Hanemann et al., 1991). Likewise, Calia and Strazzera (2000) demonstrate that the double-bounded format is more efficient than the simple one, yielding more precise and accurate estimates of the WTP (true WTP). These characteristics of the accuracy of the double-bounded dichotomous format are desirable to achieve the goal of this study, which is to determine the willingness to pay (WTP) of visitors for ecotourism services at La Algarroba cascade.

With this method, there are two answers for each respondent, providing more information than the model without a follow-up question (Lopez-Feldman, 2012). In this case, there will be one of the following four possibilities.

1. If the contestant answers “YES” to the first question and “NO” to the second one, it means  $B_i^u > B_i$ . In this case, it is inferred that  $B_i^u > WTP_i > B_i$ .
2. The contestant answers “YES” to the first question and “YES” to the second one, then  $B_i^u \leq WTP_i \leq \infty$ .
3. The contestant answers “NO” to the first question and “YES” to the second one, then  $B_i^d < B_i$ . In this case  $B_i^d \leq WTP_i < B_i$ .
4. The contestant answers “NO” to the first and second questions; in this case, it is obtained that  $0 < WTP_i < B_i^d$ .

For cases 1 and 3, there are well-defined intervals for the willingness to pay for each contestant; in contrast, intervals 2 and 4 are like those obtained with the simple referendum method. In this case  $B_i^u$  y  $B_i^d$  are closer to the actual value of the willingness to pay than  $B_i$ . This provides more information than the single-question format of WTP.

The econometric model in this dual-question context specifies the answers in terms of probability (Haab & McConnell, 2002a; Hanemann et al., 1991; Tudela, 2017). The probabilities of *yes-yes*, *yes-no*, *no-yes*, and *no-no* responses are given by:

$$\begin{aligned}
 Prob(\text{yes, yes}) &= 1 - F(\beta'x_i^u) \\
 Prob(\text{yes, no}) &= F(\beta'x_i^u) - F(\beta'x_i) \\
 Prob(\text{no, yes}) &= F(\beta'x_i) - F(\beta'x_i^d) \\
 Prob(\text{no, no}) &= F(\beta'x_i^d)
 \end{aligned} \tag{3}$$

The econometric estimation problem is solved through the maximum likelihood method with the joint probability density function (Tudela & Leos, 2017, p.19), which is given by:

$$L = \prod_{i=1}^n (1 - F(\beta'x_i^u))^{d_i^{yy}} F(\beta'x_i^u) - F(\beta'x_i)^{d_i^{yn}} F(\beta'x_i) - F(\beta'x_i^d)^{d_i^{ny}} F(\beta'x_i^d)^{d_i^{nn}} \tag{4}$$

The log-likelihood function is as follows:

$$\begin{aligned}
 \sum_{i=1}^n \left[ d_i^{yy} \ln \left( 1 - \frac{1}{1 + \exp^{-(\beta'x_i^u)}} \right) + d_i^{yn} \ln \left( 1 - \frac{1}{1 + \exp^{-(\beta'x_i^u)}} - \frac{1}{1 + \exp^{-(\beta'x_i)}} \right) + \right. \\
 \left. d_i^{ny} \ln \left( 1 - \frac{1}{1 + \exp^{-(\beta'x_i)}} - \frac{1}{1 + \exp^{-(\beta'x_i^d)}} \right) + d_i^{nn} \ln \left( \frac{1}{1 + \exp^{-(\beta'x_i^d)}} \right) \right]
 \end{aligned} \tag{5}$$

Where  $d_i^{yy}$ ,  $d_i^{yn}$ ,  $d_i^{ny}$  and  $d_i^{nn}$  are binary variables that take the value of 1 when the respondent’s answer is in that position and 0 otherwise. The maximum likelihood estimator is obtained by maximizing this function with the parameters as decision variables (Tudela & Leos, 2017; Hanemann et al., 1991).

### 3.7. Data

A total of 167 valid surveys were obtained for the WTP estimation. Table 1 presents the variables collected in the survey, the type of data, and their descriptions.

**Table 1**  
*Variables included as determinants of WTP*

Variable	Description
First bid	A hypothetical unique logarithm was first suggested to respondents as a bid.
Second bid	A hypothetical unique logarithm second bid was suggested to respondents.
Income	Income level reported by the respondent
Age	Age of respondents in years at the time of the survey
Gender	1 male, 0 female
Education	Level of education of the respondent at the time of the survey
Marital status	1 married, 0 otherwise
Ecotourism awareness	1 if you know what ecotourism is, 0 otherwise
Security conditions	1 if there is a perception of an improvement in security conditions, 0 otherwise

71.3% of the respondents answered *YES* when asked if they would pay an ecotourism entrance fee for the natural pool “Cascada la Algarroba.” However, the proportion of people who answer “yes” decreases as the amount offered gradually increases, which is in line with microeconomic theory.

Regarding the independent variables, the bid1 variable represents the first average WTP value (COP \$ 8,470), and the bid2 variable represents the second average WTP value (COP \$ 0,500). The average income is COP \$ 920,000, and the average age of the respondents is 41. Gender, marital status, ecotourism awareness, and security and public order conditions are dichotomous variables that take values of 1 or 0. Table 2 shows descriptive statistics.

**Table 2**  
*Descriptive statistics of the independent variables*

Variable	Code	Mean	Standard deviation	Minimum	Maximum
First bid	bid1	48,470	23,287	25,000	100,000
Second bid	bid2	80,500	59,310	15,000	200,000
Income	inc	920,000	794,862	0	4,850,000
Age	age	41.12	14.58	23	76
Gender	gen	0.56	0.37	0	1
Education	edu	3.54	1.42	1	6
Marital status	marital	0.63	0.19	0	1
Ecotourism awareness	ecotur	0.67	0.21	0	1
Security conditions	secur	0.58	0.23	0	1

Note. First and second bid in Colombian pesos

## 4. Results

We made several estimations by gradually increasing the control variables to verify the robustness of the results, i.e., to check the significance and stability of the coefficients, as well as the sensitivity of the signs. We started with a univariate model using the payment vector (bid1) as the sole determinant. We progressively added more control variables, ultimately achieving eight model estimations: one restricted model (univariate) and seven unrestricted models (multivariate). This procedure, used in the empirical literature on WTP, enables the identification of the influence of control variables on WTP (Villena & Lafuente, 2013). The welfare measures (mean and median) of the WTP were established using Jeanty’s (2007) method, and the confidence intervals were constructed following the approach of Krinsky and Robb (1986). Table 3 presents the results of the estimations with the double follow-up format.

**Table 3**  
**Double follow-up coefficient estimation**

Models/variables	1	2	3	4	5	6	7	8
bid	-0.0000215**	-0.09994*	-0.09854*	-0.09779*	-0.09489*	-0.09008*	-0.08901*	-0.08004*
Income		0.00488**	0.00491**	0.00488**	0.00483**	0.00464*	0.00472*	0.00426*
Gender			0.53181***	0.52384***	0.48177**	0.70832**	0.72426**	0.67996*
Age				1.96821*	1.93371**	1.99288*	1.76607*	1.56874
Education					5.88889*	5.06851*	5.03354**	5.41379*
Marital status						1.96562**	1.97288**	1.87943**
Ecotourism awareness							1.13817***	1.98062*
Security conditions								6.04774**
Constante	0.95576**	0.92601**	0.83958*	0.94992	0.92311	0.97553*	0.97006	0.953868
Sample	167	167	167	167	166	164	161	161
P-value test Wald	0.0468	0.0573	0.1103	0.2174	0.1799	0.1786	0.1804	0.1817
Akaike information criterion	452.21	437.38	422.11	404.74	398.01	375.82	356.05	337.68

\*, \*\*, and \*\*\* indicate significance levels at 0.1, 0.05, and 0.001, respectively.

The results in Table 3 show that the signs of the coefficients accompanying the explanatory variables are those expected *a priori*, i.e., the logarithm of the WTP variable (bid) maintains a negative sign in all specifications. In other words, the probability of answering affirmatively to the question on WTP decreases as the payment values increase. This affirmation is statistically significant for all estimations. Likewise, the other variables follow the same trend and, in most cases, are statistically significant. These results provide evidence in favor of the robustness of the findings. On the other hand, the more explanatory variables are included, the better the model's fit and the greater its descriptive power, as observed by reviewing the Akaike information criterion and the Wald test.

Regarding the signs of the coefficients, the positive sign of the variables indicates that if the respondent has a higher income and a good perception of the security and public order conditions for ecotourism trips and activities, then the probability of being willing to pay increases. In short, there is a directly proportional and significant relationship between these control variables and the dependent variable.

Table 4 presents the WTP values calculated from models 1 to 8 in the previous table. For the first model, in which only the vector of payments is included as an explanatory variable, the WTP is COP\$44,454 (USD\$13.6). The estimated WTP from models 2 to 8 increases to a range between COP\$44,932 and COP\$50,100 (USD\$13.7 and USD\$15.2). We also highlight that Model 8 includes all the explanatory variables (payment vector, income, gender, age, education, marital status, ecotourism awareness, and perceptions of security and public order). Hence, the WTP value of COP\$50,100 (USD\$15.2) is more consistent. Furthermore, the WTP estimates are statistically significant at the 5% level, and the confidence intervals are calculated using the Krinsky and Robb (1986) method.

**Table 4**  
**Mean/median of the estimated WTP**

Welfare measure/ model	1	2	3	4	5	6	7	8
DAP	44,454.0	44,932.2	45,852.8	46,751.0	47,896.7	48,524.6	49,837.3	50,100.1
ASL*	0.0079	0.0434	0.0341	0.0497	0.0488	0.0426	0.0396	0.0422
IC LI	17,130.05	22,608.87	23,975.65	26,997.42	27,980.53	30,505.71	33,302.90	35,741.96
IC LS	59,201.77	66,774.03	78,914.92	85,745.87	92,963.82	98,050.46	10,7003.64	114,881.90

WTP: mean/median of willingness to pay. ASL\*: achieved significance level for the Ho test: WTP<=0 vs. WTP>0. CI LI: inferior limit. CI LS: superior limit.

An essential aspect of the study is that it allows us to understand the influence that the ecosystem benefits from the Algarroba cascade has on visitors, their perception of the degree of security, and the economic impacts on local communities regarding WTP. The results show that 68% of respondents who were already aware of the ecosystem benefits provided by the Algarroba cascade answered affirmatively to the question about their willingness to pay. The same occurred with the perception of security because 96% of the respondents stated that the introduction of the peace agreement and the improved perception of security influenced their decision to practice ecotourism.

These results can also contribute to establishing guidelines for managing ecotourism strategies and defining a national ecotourism policy. In the first case, the directly proportional relationship between WTP and income, gender, age, education, and marital status allows us to identify the profile of visitors with preferences for ecotourism – which was adults of working age with medium to high incomes at least an undergraduate education, and married, are more likely to pay to access ecotourism services. This enables the design and management of strategies tailored to households with these characteristics.

Regarding the positive relationship between ecotourism awareness, security conditions, and WTP, a good perception of security conditions is a crucial factor in the development of public policy on ecotourism. In this case, the study's findings underscore the importance of integrating and articulating security programs into the planning and design of policies that foster the development of ecotourism activities and ensure their sustainability.

Another essential aspect revealed by the study is that a higher level of environmental knowledge and awareness increases WTP, so the inclusion of awareness and promotional campaigns on good practices in ecotourism, ecological conservation, and the preservation of environmental values in the design of a public policy, can stimulate social changes and a greater interest in the practice of ecotourism.

## 5. Discussion

71.3% of respondents were willing to pay a fee for ecotourism activities that would allow them to experience a connection with nature and protect natural heritage. This finding is consistent with those of other studies, which have also revealed a similar proportion of visitors willing to pay a fee for access to natural attractions or for the conservation of natural areas. For example, a study conducted by Aseres and Sira (2020) found that 75% of visitors were willing to pay a fee that would be allocated to a conservation fund for a protected area. Similarly, the preference of visitors for an ecotourism experience based on environmental protection and conservation in the La Algarroba waterfall is linked to values related to heritage and existence, which is also consistent with the results found in other studies in which the WTP estimate is associated with these non-use values (Pedroso & Kungu, 2019; Schutgens et al., 2018), with the landscape standing out as an added value (Dryglas & Salamaga, 2023).

The study also reveals that, among the determinants of ecotourism, there are additional factors beyond socio-demographic and economic aspects (such as gender, age, income, occupation, and educational level) that are traditionally considered in the literature. Many authors have found that the degree of awareness or knowledge of sustainability, environmental conservation, and ecotourism among visitors affects the willingness to pay (WTP). Variables such as degree of biodiversity reduction and wetland management funds (Dushani et al., 2021), environmental governance (Xu et al., 2021), membership in an ecological or environmentalist organization (Estifanos et al., 2021), attitude towards conservation and environmental concern (Aseres & Sira, 2020), and ecotourism awareness (Akinyemi & Mushunje, 2020), are relevant in WTP studies and are associated with the estimation of use and non-use values.

Socioeconomic variables, such as income, gender, age, education, and marital status, which are frequently used in studies related to WTP (Saha & Mukul, 2022; Siew et al., 2015; Xu et al., 2020, 2021), were included in this study. Similarly, we used the ecotourism awareness variable, which is used more frequently in recent ecotourism WTP studies because of its importance in reflecting the degree of ecotourism knowledge and awareness and the interest in protecting and conserving biodiversity (Akinyemi & Mushunje, 2020; Aseres & Sira, 2020; Dushani et al., 2021). We also included the security and public order perception variable, which sets our variables apart from the determinants identified in our literature review. We included it due to the specific context of public order and security, which, historically, has affected Colombia and because of the post-conflict transition since the signing of the Peace Treaty in 2016.

The implementation of the peace agreement led to the peaceful demobilization of the FARC guerrilla. It provided opportunities for social reintegration for armed actors, which reduced illegal activities such as kidnapping and extortion and fostered a scenario of democratic strengthening. This led to the creation of the Special Jurisdiction for Peace (JEP) to judge those responsible for the conflict. These aspects created new opportunities for regional economic development, such as ecotourism. They modified the perception of national and foreign tourists regarding the security they appreciate when visiting natural areas in the country. In 2016, non-resident tourism reached a value of nearly 4.5 million visitors, setting a historical record; additionally, almost 1.4 million tourists visited natural spaces, including national parks. The context of peace and the guarantees necessary for its maintenance have fostered conditions of stability, public order, security, and investment attraction in ecotourism projects, which favor regional strategies for promoting ecotourism.

WTP estimates range from COP\$44,932 to COP\$50,100 (USD\$13.6 to USD\$15.2) and is consistent with the results of other studies. For instance, Lee et al. (2019) estimate a willingness-to-pay (WTP) of between USD 10.55 and USD 18.48 for ecotourism in whale-watching areas and a WTP of between USD 9.06 and USD 17.83 for socio-cultural interpretation services and entrance to the whale museum. Meanwhile, Witt (2019) finds that visitors to five protected areas in Mexico (Calakmul, Coba, Palenque, Sian Ka'an, and Yum Balam) are willing to pay entrance fees for ecotourism in these protected areas, ranging from USD 13.33 to USD 20.83. One aspect contributing to the similar WTP estimates in Witt's study and this paper is the homogeneity in the ecotourism payment method and the use of double-bounded dichotomous choice questions in both cases.

Finally, some critical aspects of the implementation of an ecotourism project at La Algarroba Waterfall include the challenges faced by the local community in creating forms of community association that generate income and contribute to achieving sustainability policies (Eshun & Tichaawa, 2020), as well as the monitoring, follow-up, and evaluation that allow for the measurement of social, economic, and environmental impacts (Coccosis & Koutsopoulou, 2020).

## 6. Conclusions

Our study results show that 71.3% of visitors would be willing to pay for ecotourism activities at the La Algarroba waterfall. However, respondents were more sensitive to increases in the payment vector; that is, visitors were less willing to pay when a higher rate was proposed. Our study also provides empirical evidence on the effect of various factors on WTP, particularly the degree of ecotourism awareness, which encompasses sensitivity to environmental conservation, preservation of cultural and ecological values, and knowledge of ecotourism activities. Therefore, we found that the greater the knowledge and ecotourism culture of visitors, the more likely they are to pay an ecotourism fee in the study area. Similarly, another relevant determinant was security and public order, which reflects visitors' perceptions of tranquility when engaging in ecotourism activities. We can conclude that visitors tend to participate more in ecotourism activities when they have a better opinion of security and public order, which is also directly related to a higher willingness-to-pay (WTP).

Hence, good security and public order conditions are necessary for promoting alternative ecotourism-based income-generating activities for the local population.

The estimated WTP results range from USD 13.6 to USD 15.2. Although these results are consistent with the results of other studies, they should be interpreted with caution. Many conservation areas are susceptible to being undervalued due to the difficulty of accessing them, as well as cultural and environmental awareness, dependence on traditional productive activities such as agriculture, livestock farming, and mining, or changes in security and public order conditions, which could generate biases in the WTP estimates. However, our results raise the possibility of formulating policies and designing regulation changes to create a fund for conserving and presenting protected areas of interest through an ecotourism fee.

The results of the study may be helpful for the comparative analysis of the WTP in similar natural settings. However, they must be interpreted with caution to draw general conclusions or extrapolate the results to other contexts, given the specific natural, security, and social conditions. Another limitation is the capacity of local environmental and tourism authorities to maintain environmental conservation programs that prevent environmental degradation processes. Consequently, the WTP decreases due to visitors' low perception of the environmental quality status of the La Algarroba pool. On the other hand, a field of study for future research, which can enrich the analysis of the WTP on ecotourism and environmental values, can be the differentiation of preferences in ecotourism by population groups, such as the preferences (and the WTP) of generation Y or "millennials", or by gender, among others.

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