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URBAN PARKS: ASSESSING NON-MARKET ENVIRONMENTAL VALUES AND POLICY STRATEGIES FOR SUSTAINABLE URBAN DEVELOPMENT

PARQUES URBANOS: EVALUACION DE LOS VALORES AMBIENTALES NO COMERCIALES Y ESTRATEGIAS POLITICAS PARA UN DESARROLLO URBANO SOSTENIBLE

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Abstract

Samanes Park is the largest urban park in Ecuador and the third in Latin America. The park is one of the country's protected areas, home to many native and wild species and a recreation space for local and foreign tourists. On the other hand, being a non-excludable non-rival good, Samanes Park is a public good. Many public goods do not have a market; consequently, they cannot be priced. The problem with the above is that they are not incorporated into decision-making, leading to their deterioration over time; Samanes Park is an example of the above. However, the population demands this type of goods, and its value is reflected in the consumer surplus. Non-market valuation aims to estimate the consumer surplus of public goods. This surplus can be used as a reference for public policy projects that aim to preserve the resource. This research applies the travel cost method (indirect valuation method) to estimate the consumer surplus of site visitors. The consumer surplus was estimated at US$4.50 per visit (per individual).

Keywords: *Samanes park, economic value, developing countries.*

JEL Classification: *Q26, Q51, H41.*

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Resumen

El Parque Samanes es el parque urbano más grande del Ecuador y el tercero en América Latina. Es una de las áreas protegidas del país, hogar de muchas especies nativas y silvestres, y un espacio de recreación para turistas locales y extranjeros. Asimismo, al ser un bien no excluible y no rival, el Parque Samanes es un bien público. Muchos bienes públicos no tienen un mercado; en consecuencia, no pueden tener un precio. El problema de lo anterior es que no se incorporan en la toma de decisiones, lo que conlleva a su deterioro con el tiempo; el Parque Samanes es un ejemplo de ello. Sin embargo, la población demanda este tipo de bienes, y su valor se refleja en el excedente del consumidor. La valoración económica de bienes sin mercado busca estimar el excedente del consumidor de los bienes públicos. Este excedente se puede utilizar como referencia para proyectos de política pública que busquen preservar el recurso. Esta investigación aplica el método del costo de viaje (método de valoración indirecta) para estimar el excedente del consumidor de los visitantes al sitio. El excedente del consumidor se estimó en 4,50 dólares por visita (por persona).

Palabras clave: *Parque Samanes, valor económico, países en desarrollo.*

Clasificación JEL: *Q26, Q51, H41.*

1. INTRODUCTION

Urban parks offer various benefits to societies. For example, they improve people's health since they provide a direct link with nature (Zambrano-Monserrate and Tarupi-Montenegro, 2024). They are also spaces where people can socialize and practice sports. All these actions are beneficial for the integral development of the human being (Tzoulas *et al.*, 2007; Thompson *et al.*, 2012).

One of the most important parks in Latin America is *Samanes* Park. This national recreation area is located within its urban perimeter in the northern zone of Guayaquil (figure 1). Its creation aimed to recover the native vegetation and wildlife in that area and provide a space for family recreation. One aspect that characterizes this area is its 2.4 kilometers of riverside frontage on the banks of the Daule River, which is also used for recreational and tourist purposes (Ambiente, 2014).

Despite the importance of this urban park, it has presented constant deterioration in recent years. For example, many of its green areas have disappeared due to lack of maintenance; the lights in specific sectors (such as the lagoon area) are constantly damaged, making it difficult to access the site at night. Some park areas are overgrown, encouraging the proliferation of flying insects in winter. In addition, part of the

physical infrastructure, such as exercise machines and sports courts, seems to be in poor condition and deteriorated.

The above problem can be explained because *Samanes* Park is a public good and does not have a market price. The absence of a price makes it difficult to incorporate this type of goods in decision-making, leading to their deterioration over time. However, the population values these types of resources, and this value is reflected in the consumer surplus. Non-market valuation aims to estimate the consumer surplus of public goods (Zambrano-Monserrate *et al.*, 2023). This surplus can be used as a reference for public policy projects that aim to preserve the asset (Alves *et al.*, 2017).

For this reason, this research aims to estimate the consumer surplus of visitors to *Samanes* Park. The individual trip cost method is used, relating the frequency of visits to the costs incurred by visitors (Ariza *et al.*, 2012). This method has been frequently used to value public goods with environmental characteristics (Zhang *et al.*, 2014; Zambrano-Monserrate *et al.*, 2018; Chae *et al.*, 2012; Voke *et al.*, 2013; Hanauer & Reid, 2017).

Among the most outstanding results, we find an inverse and statistically significant relationship between the frequency of visits and the costs of access to the place. This result is consistent with previous studies in other locations (Rathnayake, 2016; Lamsal *et al.*, 2016). The estimated consumer surplus was US$4.50 per person per visit. We also found that people who visit the park for sports, tourism, or to eat/drink something have a higher frequency of visits than those for cultural purposes. This statistically significant difference shows that park administrators must promote cultural activities. We also found that as the visitors' age increases, their visits' frequency decreases. Therefore, local authorities should promote the use of the park by elders.

The rest of the article is divided into 6 sections: section 2 describes the study area. Section 3 examines the methodology. Section 4 describes the data collection process and the definition of variables. Section 5 presents the results. Finally, section 6 presents the conclusions.

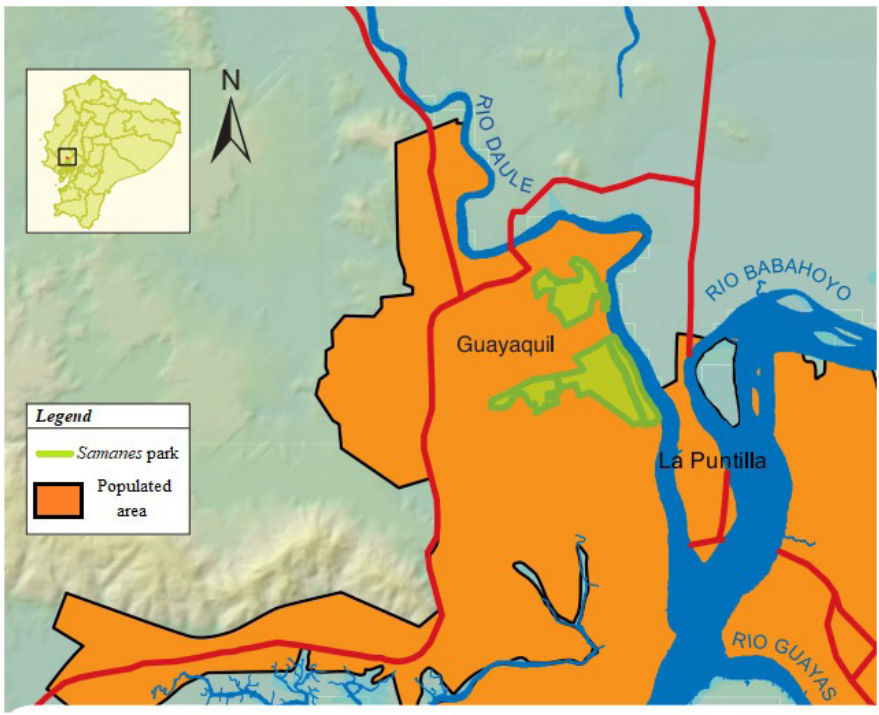
2. ABOUT *SAMANES* PARK

Samanes Park, also known as *Samanes* Ecological Park, is located in Guayaquil, Ecuador, whose first phase was inaugurated in January 2010. It has an area of 851 hectares, making it the third-largest park in Latin America, behind Chapultepec Park in Mexico and Simón Bolívar Metropolitan Park in Colombia (En Guayaquil, 2019).

The park has 57 sports courts for the practice of various sports, a soccer stadium, and a multi-sports building divided into two blocks, where a coliseum and a gym are located. It also has bike paths, jogging tracks, playgrounds, and camping areas (Carvache-Franco *et al.*, 2018).

FIGURE 1

LOCATION OF SAMANES PARK



Source: Ambiente (2014).

The park has an events plaza with a capacity for up to 150,000 people, nurseries, farms, bird reserves, stables, and artificial lakes, the largest of which has an area of 4,892 square meters. The park's nurseries are expected to produce 500,000 plants yearly to reforest various city areas. In the park's forest reserve, people can zip-line and climb, and there are mountain bike tracks.

The recreation area is made up of several blocks located within the city of Guayaquil. Some private developments surround these blocks. Two borders to the west with the Daule River, whose surrounding area, an artificial spa of 7.2 hectares, will be built for water sports. A boardwalk and a naval museum will also be built in the area (Sacoto, 2014).

3. METHODOLOGY

Non-market economic valuation seeks to assign a monetary value to those goods that do not have an explicit market. Some valuation methods, which can be classified as direct and indirect, have been developed. The choice of method depends on the specific characteristics of the environmental good or service being valued (Zambrano-Monserrate, 2024). Direct methods (stated preferences) directly ask the population about their valuation of a particular environmental good or service. In contrast, indirect methods (revealed preferences) are based on specific population behaviors to indirectly derive the value they assign to an environmental resource. Some consider Indirect methods superior since people are not directly asked about how much they value the good but other questions that indirectly reveal their valuation, eliminating biases related to hypothetical bias or strategic behavior.

Moreover, direct methods depend on the respondent's familiarity with the valued goods (Mendelsohn, R. & Olmstead, S., 2009). The two main indirect methods are the Hedonic Pricing Method (HPM) and the Travel Cost Method (TCM). The HPM uses property values as an indicator of the value people place on certain amenities (Palmquist, 2005), while the TCM, as discussed by Selivanov and Hlaváčková (2021), is more appropriate for valuing recreation sites and estimating the economic benefits associated with them.

The TCM relates the frequency of visits to a site to the costs incurred by visitors. The consumer surplus can be obtained from this relationship, which is the appropriate welfare measure to obtain economic value.

Since the dependent variable is counts, applying an estimation method according to this behavior is necessary, with the negative binomial regression being the appropriate one. Since the surveys were conducted on the site, people logged at least one visit in the last 12 months. As a consequence, the dependent variable is truncated at zero. For this reason, our model to apply was a zero-truncated negative binomial regression.

Long and Freese (2006) state that the following can be used to express the outcome variable's expected value:

$$\begin{aligned} E(Y \mid X) = \lambda_i &= exp\left(\boldsymbol{X}_i'\beta\right) \\ &= exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_i x_i) \end{aligned} \tag{1}$$

where β_i is the estimated NBR factor for the i^{th} variable in this model and β_0 is the intercept. For this research, the outcome variable is the number of visits to the *Samanes* Park. Per individual per year, a survey was done at this study site.

4. DATA COLLECTION PROCESS AND VARIABLES DEFINITION

4.1. Survey guidelines

A face-to-face survey was conducted on the site with people over 18. Only one person was randomly selected from the group. Respondents were told the purpose of the study and that their answers would be used exclusively for academic purposes. The data was collected from April 14th to April 28th, 2023. In sum, 440 people were surveyed. After removing inconsistent and outlier surveys, a final sample of 388 was obtained.

The survey was split into three sections. The first section included questions related to respondents' costs when visiting *Samanes* Park. Other questions included the type of transportation they used to get to the site, the time it took them to get there, and the number of times they visited the park the year before the survey. In the second section, the respondents, using a Likert scale, gave their opinions about the quality of the green areas and physical infrastructure. They also indicated the main activity they carried out during their visit and whether *Samanes* Park was the most visited recreational place last year. Age, gender, marital status, monthly family income, place of residence, and most significant level of education were among the socioeconomic questions in the third segment.

4.2. Variables

To calculate the minimal travel expense and the potential loss from travel time (table 1), we followed the work of Menendez-Carbo *et al.* (2020).

TABLE 1

TYPES OF TRAVEL COSTS

Model	Abbreviation	Definition
1	MTE	Minimal travel expense
2	PLTTMTE	Potential Loss from Travel Time +MTE

PLTT: Potential Loss from Travel Time.

MTE refers to the Minimal Travel Expense to *Samanes* Park, denominated in US dollars (US$), covering all necessary expenses incurred during the journey to the site. These expenses are associated explicitly with transportation costs. MTE includes the Round-Trip Vehicle Operation Costs (RTVOC), the Parking Rate (PR), and the Round-Trip Ticket Costs on Public Transport (RTTPCPT) as follows:

$$MTE = RTVOC + PR + RTTPCPT \quad (2)$$

If the group used public transportation, then RTVOC and PR are zero, and only the RTTPCPT is to be considered. If the opposite happened, then the value of RTVOC had to be estimated multiplying the Average Running Cost (ARC) by the distance (D) by 2 since the formula must consider not only the trip to go to *Samanes* Park but also to return to the surveyed individual's starting point as follows:

$$RTVOC = 2 * ARC * D \quad (3)$$

The ARC includes the costs of fuel, vehicle, and tires maintenance. We considered the average running costs of different types of cars shown in Menendez-Carbo *et al.* (2020). The distance was computed in kilometers. We multiplied the average speed (s) of 45 km/h by the average travel time (t) in minutes required for individuals to reach the destination.

PLTTMTE represents the Potential Loss from Travel Time (PLTT) plus the Minimal Travel Expense (MTW).

$$\text{PLTT} = \left[0.3 \times \frac{y}{168}\right]\left[2 \times \frac{t}{60}\right] \quad (4)$$

Where 0.3 is a weight on income, y is the monthly household income divided by the average number of hours worked per month in Ecuador and t is the average time of travel to get to *Samanes* Park, in minutes.

Other control variables were included in the study. This inclusion was done to avoid endogeneity problems. For example, the variable "main activity" captures the key activity of the respondent when visiting *Samanes* Park. Respondents were also asked about their perception of the quality of the site. Those who responded that the quality is good or excellent are expected to visit the site more than those who responded that the quality is poor. Socioeconomic variables such as family income, age, education, etc., were also considered. Table 2 shows all the variables considered in the research.

TABLE 2

VARIABLES DEFINITION

Variables	Description	Treatment
Visits	Number of visits to *Samanes* park per year	Discrete
MTE	Minimal travel expense	Continuous
PLTTMTE	Potential Loss from Travel Time +MTE	Continuous
Main activity	Cultural/artistic activity=1; Sports activity =2; Strolling and exploring=3; Dining, drinking= 4.	Categorical
Most visited recreational site	No=0; Yes=1.	Categorical

Variables	Description	Treatment
Physical infrastructure quality	Bad=0; Regular=1; Good=2; Excellent=3.	Categorical
Green areas quality	Bad=0; Regular=1; Good=2; Excellent=3.	Categorical
Family size	Household members	Discrete
Family income	Less than US$ 450=1; US$ 450-US$ 700=2; US$ 701-US$ 1300=3; US$ 1301-US$ 1700=4; US$ 1701-US$ 2000=5; US$ 2001-US$ 3000=6; Higher than US$ 3000=7	Categorical
Sex	Woman=0; Man=1.	Categorical
Age	18-22 years old=1; 23-30 years old=2; 31-45 years old=3; 46-55 years old=4; 56 years old or more=5	Categorical
Education	Primary Education =1; High School=2; Undergraduate Studies=3; Postgraduate=4.	Categorical

5. RESULTS

5.1. Descriptive analysis

Table 3 shows that the frequency of visits to the *Samanes* park is eight times a year on average. The average MTE is $1.95; the minimum MTE is zero; this last result is explained since there are people who do not use any means of transportation to get to the site but rather walk. When we add the PLTT to the MTE, the value goes up to US$3.04. The average on-site expenditure is US$11.82. Finally, the number in party is made up of a minimum of 1 and a maximum of 10 people.

TABLE 3

DESCRIPTIVE STATISTICS OF NUMERICAL VARIABLES

Variable	N	Mean	Standard deviation	Minimum	Maximum
Visits	388	8.30	22.45	1	300
MTE	388	1.95	1.05	0	7.34
PLTTMTE	388	3.04	1.37	0.05	11.48
On-site expenditures	388	11.82	10.71	0	55
Family size	388	3.77	1.34	1	10

Respondents indicated that “Strolling and exploring” is their main activity when they go to the park, and their secondary activity is “Sports activity”. To a lesser extent, their activity is “Cultural/artistic activity”. Additionally, 56.19% of those surveyed indicated that *Samanes* Park is the recreational site they have visited the most in the

last 12 months. Analyzing the quality of the services, the majority of those surveyed considered that both the quality of the physical infrastructure and the green areas are "good." However, about 30% of those surveyed rated the quality of both variables as "regular" (Table 4).

Most respondents are men (54.12%). Additionally, 25.77% of users' monthly family income is between US$450-US$700. 49.74% of those surveyed have High School as their school level. 29.64% of the respondents are between 23-30 years. According to the latest census, these socio-economic results are consistent with the typical profile of the citizens of Guayaquil, according to the latest census (INEC, 2010).

TABLE 4

DESCRIPTIVE STATISTICS OF NON-NUMERICAL VARIABLES

Variable	Category	Frequency	Percentage (%)
Main activity	Cultural/artistic activity	31	7.99
	Sports activity	124	31.96
	Strolling and exploring	153	39.43
	Dining/drinking	80	20.62
Most visited recreational site	No	170	43.81
	Yes	218	56.19
Physical infrastructure quality	Bad	59	15.21
	Regular	125	32.22
	Good	135	34.79
	Excellent	69	17.78
Green areas quality	Bad	41	10.57
	Regular	117	30.15
	Good	144	37.11
	Excellent	86	22.16
Family income	Less than US$ 450	45	11.60
	US$ 450-US$ 700	100	25.77
	US$ 701-US$ 1300	81	20.88
	US$ 1301-US$ 1700	62	15.98
	US$ 1701-US$ 2000	39	10.05
	US$ 2001-US$ 3000	23	5.93
	More than US$ 3000	38	9.79
Sex	Woman	178	45.88
	Man	210	54.12
Age	18-22 years old	90	23.20
	23-30 years old	115	29.64
	31-45 years old	99	25.52
	46-55 years old	68	17.53
	56 years old or more	16	4.12

Variable	Category	Frequency	Percentage (%)
Education	Primary Education	9	2.32
	High School	193	49.74
	Undergraduate Studies	137	35.31
	Postgraduate	49	12.63

5.2. Estimation results

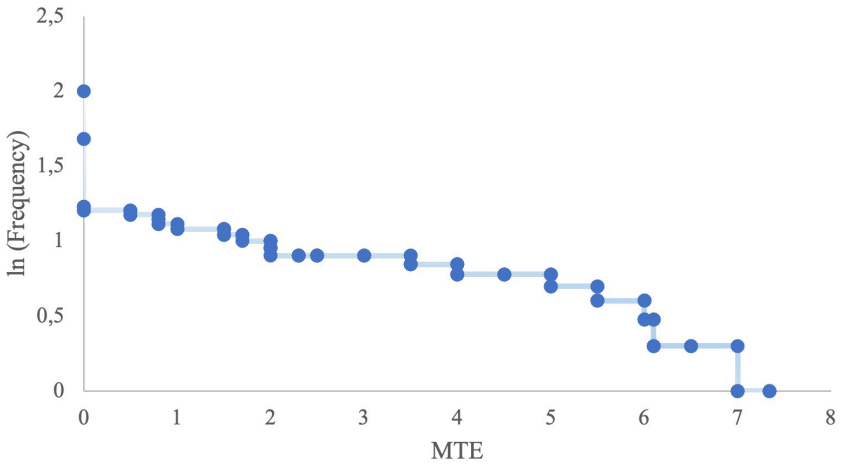
We estimated two models using the division of costs presented in Table 1. These two models were split to ease the analysis of the effect of the types of costs on recreation demands (Zambrano-Monserrate *et al.*, 2018; Menendez-Carbo *et al.*, 2020). The "Incident Rate Ratio" (IRR) was also estimated to facilitate reading the results. Table 5 shows that the travel cost variables have significant effects at 1% in both models. This result shows that the higher the costs, the lower the frequency of visits. Figure 2 portrays this relationship.

Comparing the categories of the variable "Main activity" versus those of "Artistic/cultural activity," it is obtained that the respondents whose main activity is "Strolling and exploring" visit the park four times more than those who have the "Artistic/cultural activity" as their primary activity. Both models present this difference as significant.

The perception of the quality of the park (physical infrastructure and green areas) influences the frequency of visits. For example, those visitors who rated the physical infrastructure as "excellent" visit the park almost five times more than those who rated it as "bad."

FIGURE 2

TRAVEL DEMAND CURVE



We also considered the size of the group in this research. In both models, the size of the group is significant at 5% and negative. Mayer and Woltering (2018) and Grilli *et al.* (2018) found similar results in their research.

Table 5 shows that families with an income level between "US$ 1301-US$ 1700" visited the park on average twice more than those who earned less than US$450 since the variable in this category is significant. When analyzing the other categories where the income is higher, it is observed that the relationship is reversed, the higher the income, the fewer the visits. However, the coefficients are not statistically significant. On the other hand, two significant variables for both models are "sex" and "age." Men visit the park more than women. Additionally, older users visit *Samanes* Park less.

One variable that is statistically significant but is in some categories is "education". Visitors with a high school education visit the park more often than those with primary education.

The significance of the Chi-square statistic shows that not all independent variables are zero simultaneously. In this scenario, the negative binomial distribution outperforms the Poisson regression, as evidenced by the significant likelihood ratio test for alpha at the 1% level.

TABLE 5

ZTNB RESULTS

Category	Model 1		Model 2	
Variables	Coefficient	IRR	Coefficient	IRR
MTE	–0.2221*	0.8008*	–	–
PLTTMTE	–	–	–0.1297*	0.8784*
Activities				
Artistic/cultural activity	–	–	–	–
Sports activity	1.2482**	3.4841**	1.4971**	4.4687**
Strolling and exploring	1.4364*	4.2055*	1.4488*	4.2580*
Dining/drinking	1.4052*	4.0763*	1.4791*	4.3890*
Most visited recreational site	0.8796*	2.2296*	0.9036*	2.4402*
Physical infrastructure quality				
Bad	–	–	–	–
Regular	0.7192	2.0528	0.8927	2.4417
Good	1.5023**	4.4920**	1.5538**	4.7294**
Excellent	1.6028*	4.9669*	1.7482*	5.7443*
Green areas quality				
Bad	–		–	
Regular	0.6451	1.9062	0.8951	2.4476
Good	1.3728**	3.9464**	1.6228**	5.0673**
Excellent	1.4527**	4.2746**	1.7027**	5.4887**

Category	Model 1		Model 2	
Variables	Coefficient	IRR	Coefficient	IRR
Family size	–0.6828**	0.5052**	–0.4328**	0.6487**
Family Income				
Less than US$ 450	–		–	
US$ 450-US$ 700	0.0523	1.0537	0.1023	1.1077
US$ 701-US$ 1300	0.0921	1.0965	0.1421	1.1527
US$ 1301-US$ 1700	0.7318**	2.0788**	0.7818**	2.1854**
US$ 1701-US$ 2000	–0.0812	0.9220	–0.0312	0.9693
US$ 2001-US$ 3000	–0.0782	0.9248	–0.0282	0.9722
More than US$ 3000	–0.0638	0.9382	–0.0138	0.9863
Sex	0.9321*	2.5398*	1.1821*	3.2612*
Age	–0.2891*	0.7489*	–0.0391*	0.9617*
Education				
Primary Education	–	–	–	–
High School	0.7652*	2.1494*	1.0152*	2.7599*
Undergraduate Studies	0.2381***	1.2688***	0.4881***	1.6292***
Postgraduate	0.0321	1.0326	0.2821	1.3259
Constant	–1.9212*	0.1941*	–1.8872*	0.5213*
Alpha	1.0281*	1.0281*	1.0891*	1.0891*
Likelihood-ratio test of alpha (chibar2)	1829.81*	1829.81*	1931.41*	1931.41*
Chi-squared	182.01*	182.01*	173.92*	173.92*
Log Likelihood	–962.9271	–962.9271	–959.2901	–959.2901

*, **, *** Significance level 1%, 5% y 10% respectively.

Following Bateman (2002), the consumer surplus was calculated as the inverse of the estimated coefficient ($1/\beta_1$) shown in Table 6. *Samanes* Park has an annual average of 2.92 million visits. To calculate the CS per year, this value is multiplied by the CS per visit. Lastly, the economic value of *Samanes* Park is calculated at US$13.15 and US$22.51 million per year for both models, A and B.

TABLE 6

CALCULATIONS OF CONSUMER SURPLUS

	Model A	Model B
Mean Consumer Surplus /visit	US$4.50	US$7.71
Total Consumer Surplus /year (millions)	US$13.15	US$22.51

6. DISCUSSION

Urban parks are dynamic institutions that play a vital but not fully appreciated role in societies' social, economic, and physical well-being. Its benefits are multiple, from the economic aspect (they generate employment) through environmental benefits (carbon footprint reduction, for example) to health benefits (reduction of stress and obesity, improvement of social relations) (Chan *et al.*, 2018; Tzoulas *et al.*, 2007).

In Ecuador, *Samanes* Park is the third-largest urban park in Latin America. Located in the urban area of the city of Guayaquil, the park offers different options for its visitors, from outdoor activities such as walks, hikes, boat rides to commercial and cultural activities. It is one of the favorite meeting points for Ecuadorian families.

Despite its importance, *Samanes* Park has presented some problems in the quality of its physical infrastructure and green areas. The reason for this is that the park is a public good. In this sense, the non-market valuation is of the utmost importance to quantify its value and thus establish a starting point for public policies whose objective is its preservation (Zambrano-Monserrate & Ruano, 2019).

For this reason, this research found the economic value of *Samanes* Park. The consumer surplus was estimated using an indirect valuation method; the result was US$4.50 per person per visit. We looked at two different travel cost scenarios and found that there was no positive relation between visit frequency and related expenditures in each case. Hanauer and Reid (2017) in the US and Alves *et al.* (2017) in Spain both showed findings that were comparable.

To improve the accuracy of the CS estimations and account for potential biases, other visit frequency-affecting parameters (apart from costs) were included. People can engage in a variety of activities at the Samanes Park, so the variable "Main activity" was added. Another finding indicated that individuals who primarily engage in "Strolling and exploring" or "Sports activity" frequent the site more frequently than individuals who engage in "Artistic/cultural activity". This finding allows us to suggest the public policy of promoting artistic and cultural activities. We also analyze the quality of physical infrastructure and green areas. Visitors who consider the physical infrastructure to be good quality visit the park more often than those who consider the quality poor. Authors such as Siderelis and Moore (2000), Parsons (2013), Castaño-Isaza *et al.* (2015), and Zambrano-Monserrate *et al.* (2018) show that our results are consistent with their findings. We all agree that a site's or service's quality has a big impact on how frequently people visit an environmental good. The descriptive data in this regard showed that a significant portion of those polled ranked the quality of the services provided by the park as "regular".

This study has some limitations. The first one is in the estimation of the arrival times of the people surveyed at *Samanes* Park. We ask respondents directly for their arrival time. However, other tools can be used, such as surveying and mapping the exact residential location of visitors and then calculating this time (Hanauer and Reid, 2017). Additionally, the TCM does not consider non-use values such as existence, legacy,

and option values; therefore, the total economic value of the *Samanes* Park could be even higher. Additionally, another limitation is the multipurpose trips of visitors; we assume that the only reason for the trip is to visit the site of interest.

Finally, we recommend the following public policies: 1) based on the economic value estimated in this research, a maintenance and improvement plan should be established for the physical infrastructure and green areas of the park, this will attract a more significant number of tourists, 2) cultural activities offered by the park should be promoted since only a small number of respondents indicated this category as the main activity and 3) the use of the park in older adults should be encouraged since the evidence showed a decrease in visits as the age of the respondent increased. The health benefits generated by this type of space may be of greater importance for older adults.

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