

Valuation of Environmental Services City Park 1 BSD using the Travel Cost Method (TCM) and Willingness To Pay (WTP)

Penilaian Jasa Lingkungan Taman Kota 1 BSD menggunakan Travel Cost Method (TCM) dan Willingness To Pay (WTP)

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Abstract

BSD City Park 1 has quite complete functions, including ecological, social, and aesthetics, as well as is also a city landmark and a cheap and healthy tourist attraction for residents, including visitors from outside BSD City. The study aimed to find the factors that influence the number of public visits to City Parks and to determine the value of environmental services from City Park 1 BSD through a revealed preference approach using the Individual Travel Cost Method (ITCM) and Willingness To Pay (WTP). Economic valuation through revealed preference using the Travel Cost Method (TCM) calculation, the individual Consumer Surplus value is IDR 55,664/visit with an average stay of 4.8 personal holidays per year. If it is estimated that there are 104,150 visits/year, the Economic Value of City Park 1 BSD is estimated at IDR 5,797,422,757/year. The Willingness to Pay (stated preference) analysis results for additional facilities include the average individual WTP for other sports facilities of IDR 7,619.00; The average particular WTP for adding the number of trash cans is Rp.7,619.00; The average individual WTP increases the number of toilets by IDR 15,000.00.

Keywords

BSD 1; city park; environmental services; method; total economic value; travel expense; willingness to pay.



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1. INTRODUCTION

The existence of green open spaces in urban areas is necessary for city residents to support their social, cultural, and economic activities, including protecting a city's ecological and aesthetic functions. Increasing land change (Munawir et al., 2019) impacts the environment, primarily in urban areas (Rusdiyanto et al., 2023; Munawir, 2017). It is important to maintain green open spaces in urban areas. Law No. 26 of 2007 obliges the government to provide green open spaces in urban areas that can be utilized as public spaces. A city park is a form of green open space that is designed in such a way as to support community activities, including as a means of recreation, health, socializing, and so on so that it is often referred to as a landmark that is a conflict the identity of the city (Fadlillah & Khadiyanto, 2017). However, as a public facility, city parks often receive less attention, especially maintenance, because they are non-rivalry and non-exclusive. Luckily, BSD City Park 1, under the management of the South Tangerang City Environmental Service, has received adequate attention and funding so that its condition is always well maintained. As with other public facilities, the environmental services provided by City Parks 1 BSD need to be evaluated in monetary terms. Thus, the value of environmental services can be used as additional information for policymaking related to their maintenance and development.

The Travel cost method is often used in the valuation of a natural tourist object because it is a relatively easy and simple method to estimate economic value and calculate willingness to pay (Anshary et al., 2023). Several studies related to the travel cost method have been carried out in Indonesia, Putri and Juwana (2019) related to the economic valuation of the Pindul cave tourism object in Gunungkidul district using the travel cost approach and research methods; on the other hand, Lupiyanto et al. (2023) conducted a travel cost method based environmental and Willingness To Pay for Tambakboyoy Reservoir Tourism, Sleman Regency and Anshary et al. (2023) conducted a study of the travel cost method at Lati Petangis Botanical Gardens using the travel cost method in Paser Regency, East Kalimantan. Based on several existing studies in Indonesia related to the Travel Cost Method, there are still no research studies related to City Parks combined with Willingness To Pay (WTP) as well as a comparison of the BAU demand curve and the demand curve when added to the price increase by the number of ticket visits and parking.

For this reason, this study aims to estimate the economic value of environmental services in City Park 1 BSD using the Individual Travel Cost Method. The implementation of this research begins by giving several questionnaires to visitors to BSD City Park 1 using the Snowball Sampling method. The questionnaire will be

designed in such a way as to provide an overview of respondents' perceptions of the available facilities and all costs incurred from the house to and within BSD City Park 1 until they return home. The result is a Willingness To Pay (WTP) which is a willingness to pay for environmental services from City Park 1 BSD, and Willingness To Accept, which is a person's willingness to pay to receive compensation/reimbursement due to not getting environmental services and Travel Expenses (Travel Cost) that is willing to be spent to visit City Park 1 BSD. The results of this valuation will later be considered as the Economic Value of Environmental Services from City Park 1 BSD. The purpose of this study was to find the factors that influence the number of public visits to City Park 1 BSD and to determine the value of environmental services from City Park 1 BSD through a revealed preference approach using the Individual Travel Cost Method (ITCM) and Willingness To Pay (WTP) through direct questions to respondents (stated preference).

2. METHODS

This research will be conducted at BSD City Park 1, in BSD City, Jl. Lieutenant Sutopo 15310, South Tangerang, Banten, under the authority of the South Tangerang City Environmental Service. This location was chosen because it is one of the most popular city parks in BSD City, City Park 1 has quite complete functions, including ecological functions, social functions, and aesthetics, as well as being a city landmark and a cheap and healthy tourist attraction for residents, including visitors. from outside BSD City.

Data was collected using the purposive sampling method (sometimes called purposive or judgment sampling). This data collection method aims to select samples according to criteria considered important in certain studies (Kumar Singh, 2006). Samples were taken from visitors to Taman Kota 1 BSD with a minimum of 35 random respondents, which was considered sufficient to represent the population because, in general, 30 research subjects were the boundary between a small sample and a large sample (Herman et al., 2018). Data was collected using a questionnaire that was given in the form of an open, closed, or combination questionnaire and was arranged so that the time needed to fill it was no more than 30 minutes (Munawir et al., 2022).

In this study, the Individual Travel Cost Method (ITCM) will be used, an estimate of TCM based on survey data from each visitor. The hypothesis that is built is that the number of visits to BSD 1 City Park will be influenced by the variables Total Travel Cost (X1), Annual Income (X2), Perceived Cleanliness (X3), and Perceived Conditions of Public & Sports Facilities (X4). Meanwhile, the Total Trip Cost variable (X1) is assumed

to have a negative correlation so that a negative slope will be obtained with the following function (Perman et al., 2003):

$$V_i: f(C_i, X_{1i}, X_{2i}, X_{Ni})$$

Where:

V_i : The number of individual visits to tourism objects

C_i : Individual travel costs to tourist attractions

$X_{1i}...X_{Ni}$: other variables from an individual I that are relevant

Other variables considered relevant include income, time spent, cleanliness, available facilities, and other variables considered relevant by researchers.

The second basic assumption is that the cost of visits consists of travel costs that vary from individual to individual, i , T_i , and the admission price P (which is constant with i). Visitors treat travel and entrance fees as equivalent elements of the total cost of the visit. Visitors respond in the same way to changes (increase/decrease) in total costs either due to travel costs or ticket prices $\partial V_i / \partial C_i < 0$, if it is assumed that the function $f(.)$ is linear to price and by suppressing other variables, the "trip generation equation" can be estimated as follows:

$$V_i = \alpha + \beta C_i + \epsilon_i = \alpha + \beta(T_i + P) + \epsilon_i$$

Where ϵ_i is a stochastic component or error assumed to be normally distributed independently and is expected to be zero. With assumption $\epsilon_i = 0$, then the expectation of a visit from an individual I or originating from me with a predetermined ticket price can be shown in the following equation:

$$E[V_i] = \alpha + \beta P + \beta T_i$$

Where $E[V_i]$ is the expected number of visits. However, if the tourism object does not attract ticket fees, the expected number of visits will be $E[V^*i]$ dan P^*i is a push price $E[V_i]$ become 0. Therefore:

$$P^*i = -(\alpha/\beta) - T_i \text{ and to } P = 0: E[V^*i] = \alpha + \beta T_i$$

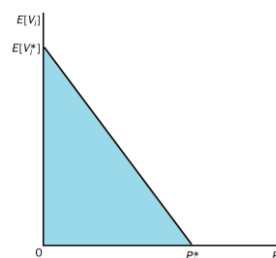


Figure 1. The linear trip-generating function

In the Marshallian demand function, at $P=0$, consumer surplus is the area of the triangle $0 E[V_i^*] P^*I$ (blue shaded area), so that the following equation can calculate consumer surplus;

$$0.5\{\alpha + \beta T_i\}\{-(\alpha/\beta) - T_i\} \text{ or } \{-0.5/\beta\}\{\alpha + \beta T_i\}\{\alpha + \beta T_i\}$$

This the Individual Marshallian Consumer Surplus (MCS_i) becomes:

$$MCS_i = \frac{-(E[V_i^*])^2}{2\beta}$$

This equation will then be used to assess consumer surplus in this study, and the Individual Marshallian Consumer Surplus will be referred to as the Individual Consumer Surplus (SK_i).

WTP is calculated using a valuation technique that goes through a direct survey by asking respondents' willingness to pay (expressed preference method) to improve the quality of City Park 1 BSD, in this case, sports facilities, trash cans, and toilets. According to Rosminiati et al. (2019), the average Willingness To Pay (EWTP) value uses the formula below:

$$MWTP = \frac{1}{n} \sum_{i=1}^n y_i$$

Where:

- MWTP : WTP average value (mean WTP)
- y_i : The maximum WTP value of the i -th respondent
- i : Respondents who are willing to pay
- N : Number of respondents

3. FINDINGS AND DISCUSSION

3.1. Econometric Analysis

The hypothesis that was built was that the number of visits to BSD City Parks 1 would be influenced by the variables Total Travel Expenses (X1), Annual Income (X2), Perceived Cleanliness (X3), and Perceived Conditions of Public & Sports Facilities (X4). In this test, the significance α is 5% (0.05). The results of the linear regression of the research data are shown in Table 1 below. From the results of linear regression, an R-value of 0.444 (44.4%) was obtained, which indicated that there was a fairly strong relationship between the visited variable (V) and the independent variables (X1, X2, X3, X4). However, in the regression, it was also found that the relationship between the low independent variable is indicated by the coefficient of determination (R Square) of 0.197 (19.7%), which can mean that the contribution of the independent variables (X1, X2, X3,

X4) to changes in the dependent variable (V) is low or that the independent variable (X1, X2, X3, X4) can only explain the dependent variable (V) of 19.7%. In comparison, the remaining 80.3% is explained by other factors not examined.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.44404
R Square	0.19717
Adjusted R Square	0.11267
Standard Error	0.93202
Observations	43

ANOVA

	df	SS	MS	F	Significance F
Regression	4	8.10703	2.02676	2.33319	0.07314
Residual	38	33.00925	0.86866		
Total	42	41.11628			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.57400	0.9030	2.8506	0.0070	0.746	4.402	0.746	4.402
Total Biaya Perjalanan	-1.0424E-06	7.706E-07	-1.3528	0.1841	-2.60E-06	5.18E-07	-2.60E-06	5.18E-07
Penghasilan pertahun	1.0270E-09	4.259E-09	0.2411	0.8107	-7.59E-09	9.65E-09	-7.59E-09	9.65E-09
Persepsi kebersihan	0.08287	0.0592	1.3997	0.1697	-0.037	0.203	-0.037	0.203
Persepsi Kondisi fasilitas Umum & Olah Raga	0.14033	0.1189	1.1798	0.2454	-0.100	0.381	-0.100	0.381

Figure 2. Table of Multiple Linear Regression Results

Source: Results of data processing questionnaire for visitors to Taman Kota 1 BSD 2022

The value of R Square (R²) ranges from 0 - 1 with the general assumption that the higher the value of R², the better the research results (can better explain the effect of the independent variable on the dependent variable). According to Hair et al. (2011) in (Meiryani, 2021b), the value of R² is expressed as strong at a value of 0.75, moderate at a value of 0.6, and weak at a value of 0.25. However, some literature states that a low R² does not mean that the quality of findings produced in research is low; in medical research, it is found that 10% of studies produce R² below 0.035, and the other 10% are very high, above 0.979 while still producing quality findings (Choueiry, 2019). Cohen (1988), in his book, even suggests lower values, namely 0.26 (substantial), 0.13 (moderate), and 0.02 (weak).

The standard error of the estimate is 0.932, which means that the visit rate (V) differs by 0.932 points from the regression line. The coefficients obtained are used to create the regression equation as follows:

$$V = \alpha + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + \beta_4(X_4) + \varepsilon$$

$$\text{Visiting} = \alpha + \beta_1 (\text{Total Travel Expenses}) + \beta_2 (\text{Annual income}) + \beta_3 (\text{Perception of cleanliness}) + \beta_4 (\text{Perception of Conditions of Public \& Sports Facilities}) + \varepsilon$$

If $\varepsilon = 0$, then the regression equation becomes

$$\text{Visiting} = 2.573 - 1,04\text{E-}06(X_1) + 1,027\text{E-}09(X_2) + 0.08287(X_3) + 0.1405(X_4)$$

The regression equation above can be interpreted as follows C constant 2,573 means visit the BSD City Park 1 per year if the independent variable is 0

- β_1 : 0,00000104 meaning that an increase in the X1 variable by 1 point will reduce visits by 0.00000104 points
- β_2 : 0,000000001027 meaning that an increase in variable X2 by 1 point will increase visits by 0.000000001027 points
- β_3 : 0.000828 meaning that an increase in the X2 variable by 1 point will increase visits by 0.000828 points
- β_4 : 0.001405 meaning that an increase in the X2 variable by 1 point will increase visits by 0.001405 points

3.2. Total Economic Value of City Park 1 BSD

The following is a summary table for calculating the Economic Value of City Park 1 BSD:

No.	KETERANGAN	NILAI
1	Jumlah responden, (i)	43 orang
2	Jumlah kunjungan responden, (V_i)	206 kunjungan
3	Estimasi jumlah kunjungan tahun 2021, (V)	104.150 kunjungan
4	Koefisien Biaya Perjalanan, (β_1)	-1,04244E-06
5	Rata-rata Surplus Konsumen Individu, ($Sk_{i,avg}$)	Rp11.466.818/tahun
6	Rata-rata Surplus Konsumen individu/kunjungan, (SK_{avg})	Rp55.664/kunjungan
7	Nilai Ekonomi Taman Kota BSD1, (E_V)	Rp5.797.422.757/tahun

Figure 3. Table of Calculation results of City Park 1 BSD Economic Value

Source: Results of processing visitor questionnaire data for City Park 1 BSD 2022

From the results of the calculation of economic value, it is found that the average consumer surplus for individual visits to City Park 1 BSD is Rp.55,664/year, thus if the estimated number of visitors is 104,150 visitors per year, then from the estimation, the Economic Value obtained from City Park 1 BSD is amounting to IDR 5,797,422,757/year.

3.3. Willingness To Pay

The average Willingness To Pay (WTP) value is calculated using equation 10 on the willingness of respondents to pay for additional sports facilities and the number of trash cans and toilets. The data table for the calculation of willingness to pay can be seen in Table 3, with a summary of the calculation results as follows.

WTP	WTP penambahan fasilitas olahraga (Rp)	WTP penambahan jumlah tempat sampah (Rp)	WTP penambahan jumlah toilet (Rp)
WTP Minimum	2.000	4.000	4.000
WTP Rata-Rata	7.619	7.595	8.333
WTP Maksimum	10.000	15.000	15.000

Figure 4. Table of Summary of Willingness To Pay Calculation results

Source: Results of processing visitor questionnaire data for City Park 1 BSD 2022

Willingness to pay respondents for the above facilities is in line with the level of satisfaction, desire, and expectations of respondents as illustrated in the descriptive analysis, where most respondents want improvements and additions to facilities, cleanliness, and toilets that still need improvement.

3.4. Functions and Demand Curves

The demand function for travel costs (Trip Generating Function) can be written as follows:

$$\text{Visiting} = \alpha + \beta_1 (X_1)$$

$$\text{Visiting} = 2.573 - 1,04\text{E-}06(X_1)$$

The function above shows that the higher the travel costs (X_1), the number of visits will decrease because the cost coefficient of visit costs (β_1) is negative, which means that it is by the initial hypothesis. From equation 12 it can be described the demand curve as below:

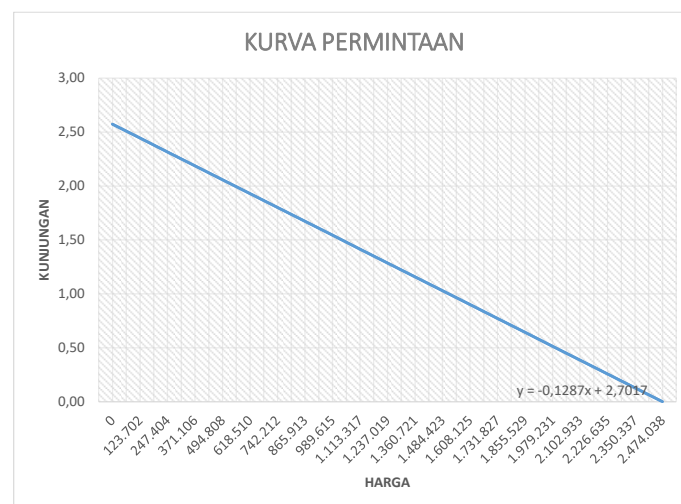


Figure 5. Demand curve

Source: Results of processing visitor questionnaire data for City Park 1 BSD 2022

From Figure 5 above, a relationship can be made between the cost of visiting trips and the estimated number of trips and individual surpluses in business as usual (BAU) conditions and the elasticity of demand/visit with the scenario if an entrance ticket is imposed and a perkier fee is as much as Rp.100,000.00/visit. As illustrated in the two curves below (note: for convenience, we turn the XY axis back to YX).



Figure 6. BAU demand curve

Source: Results of processing visitor questionnaire data for City Park 1 BSD 2022

Figure 6 shows that the number of visits is 2,3645 visits/year at a BAU visit fee of IDR 200,480.00/year, giving an average individual consumer surplus of IDR 2,687,914.00/year. Individual.

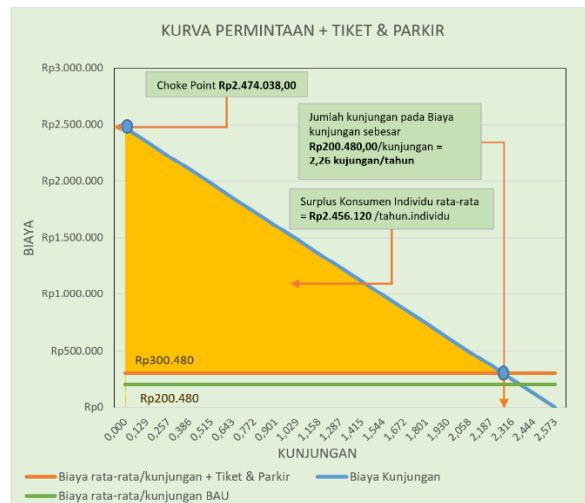


Figure 7. Demand curve when the cost of the visit plus Tickets and Parking

Source: Results of processing visitor questionnaire data for City Park 1 BSD 2022

From Figure 7, it can be seen that the number of visits decreased not significantly, only by 0.145 visits to 2.26 visits/year at the cost of visits plus ticket and parking prices of IDR 100,000/visit to IDR 300,480.00/year, which reduces the average individual consumer surplus to IDR 2,456,120.00/year. Individuals due to the Choke Point value,

which is much higher than the average travel cost. This is to the regression results, which state that travel costs do not significantly affect the number of visits to BSD City Park 1. The results of this study are in line with several studies, which explain that the cost factor does not determine the activities of the community visiting tourist attractions, but the quality of the panorama and the beauty of the tour, which determines the habits of the community always to visit these tours (Hardiyanti et al., 2020; Anshary et al., 2023).

4. CONCLUSION

City Park 1 BSD is a free tourist attraction that is in great demand by visitors, especially from the BSD and surrounding areas (Pamulang, Ciputat, etc.) by age group visitors who are dominated by adults who mostly earn above South Tangerang City Average Minimum Wage with an estimated number of visits 104,150 visits/year. The atmosphere is shady, and cool and fresh air is the main satisfaction factor for visitors. However, visitors hope there is maintenance, repair, and addition of facilities, especially sports facilities, cleaning, and toilet. Most visitors find City Park 1 BSD useful, so they intend to return to visit these attractions. Economic valuation through revealed preference using the Travel Cost Method (TCM) calculation, the individual Consumer Surplus value is IDR 55,664/visit with an average visit of 4.8 individual visits per year. If it is estimated that there are 104,150 visits/year, the Economic Value of City Park 1 BSD is estimated at IDR 5,797,422,757/year. The analysis of the elasticity of demand on the demand curve shows that travel costs do not significantly affect the number of visits to BSD City Park 1.

Respondents' hopes and desires to get better facilities are also reflected in their willingness to pay (WTP) which is revealed through direct questions (stated preference) for additional facilities as follows: The average individual WTP for adding sports facilities is IDR 7,619.00; the average individual WTP for adding the number of trash cans is IDR 7,619.00, The average individual WTP increases the number of toilets by IDR 15,000.00. Considering the factors of satisfaction, wishes, and expectations of visitors, it is necessary to repair damaged facilities because these facilities are the main attraction of BSD City 1 Park. If it is possible to add sports and games facilities, the authors suggest using a more durable material (e.g., stainless steel) to reduce maintenance costs. The main thing is to improve the quality of park cleanliness and add a very minimal number of toilets.

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