

Recreational Valuation of Pasikudah Beach Using Zonal Travel Cost MethodS. Komahan*¹, Gunaratne LHP¹¹Post Graduate Institute of Agriculture, University of Peradeniya, Sri Lanka***Corresponding author**

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Abstract: Pasikudah beach is recognized as one of the safest beaches in Sri Lanka and very famous among the visitors. The bay was endangered due to coral mining and bleaching, and now it was proposed as a marine sanctuary by National Aquatic Resources Research and Development Agency. This study was designed to analyze the recreational value of Pasikudah beach in monetary terms in order to preserve it for future generations and for further improvements in quality. Since Pasikudah beach is an environmental resource, the non-market valuation is necessary. The zonal travel cost method was used to calculate the recreational valuation of Pasikudah beach. Data on travel cost and related information were collected from randomly selected 80 visitors to the site from August to October 2016 at Pasikudah beach using two-stage random sampling method. Structured questionnaires were used to collect data and were pretested prior to use. Visitation rate / year to Pasikudah beach was significantly and negatively influenced by round trip travel cost ($p < 0.1$). The mean value for travel cost to Pasikudah was estimated in Sri Lankan Rupees (Rs.) 357.35 /- person and the mean value for round trip travel cost (including accommodation and onsite expenses) to Pasikudah was Rs. 989.40 /- person / visit. Total economic benefits from recreational uses of the Pasikudah beach were estimated around Rs. 26,361,843.21 / year.

Keywords: Non market valuation, Recreational value, Round trip travel cost, Travel Cost method.

INTRODUCTION

Beaches are a major site of recreation and remain one of a handful of democratic leisure environments in today's world Klein [1]. It is the place where people from all strata come to relax as well as to fulfill both their psychological and physiological needs. In the case of Sri Lanka, coastal areas, which carry high total economic value comprising both use and non-use values, play an important role in the planned economic development of the country [2].

Economic value can be used for natural resource management. However, these natural resources cannot readily be bought or sold in conventional markets and hence their values are not readily determined. Without such values, decision making regarding the provision of such public goods and comparison between alternative development options are difficult. The total economic value (TEV) model appraises the TEV that a person, or a household, places upon non-marketable or only partly marketable commodities such as forest, wetlands *etc.* There have been a number of attempts to divide TEV into several value components consistent with welfare economic theory [3]. One of the popular approaches to non-market valuation is the travel cost method. It is one of the methods widely used in developed countries and is

becoming popular in developing countries in assessing the benefits of outdoor recreation.

In Sri Lanka, the absence of studies of recreational or other values of the natural scenic sites has constrained important decisions in planning. Due to complete neglect or under valuation of services provided by the natural environment, much damage has been caused to the environment [4]. Estimating the recreational and other values is imperative due to misallocation of resources and conflicting views of individuals regarding conservation of the site. The value of the Pasikudah beach should be estimated in monetary terms in order to preserve it for future generations and for further improvements in quality. Even though it is a well-known beach, there were no significant studies done to estimate the recreational value. Pasikudah beach is an environmental resource. This study was designed to perform an economic assessment to reveal the recreational value of Pasikudah beach. The specific objective of this study was to use a non-market valuation method to perform this analysis.

METHODOLOGY**Description of Study Area**

The study area was Pasikudah Beach. It is located in Batticaloa District. Batticaloa District

occupies the central part of the Eastern Province and around 300 kilometers away from the Sri Lankan

capital, Colombo.

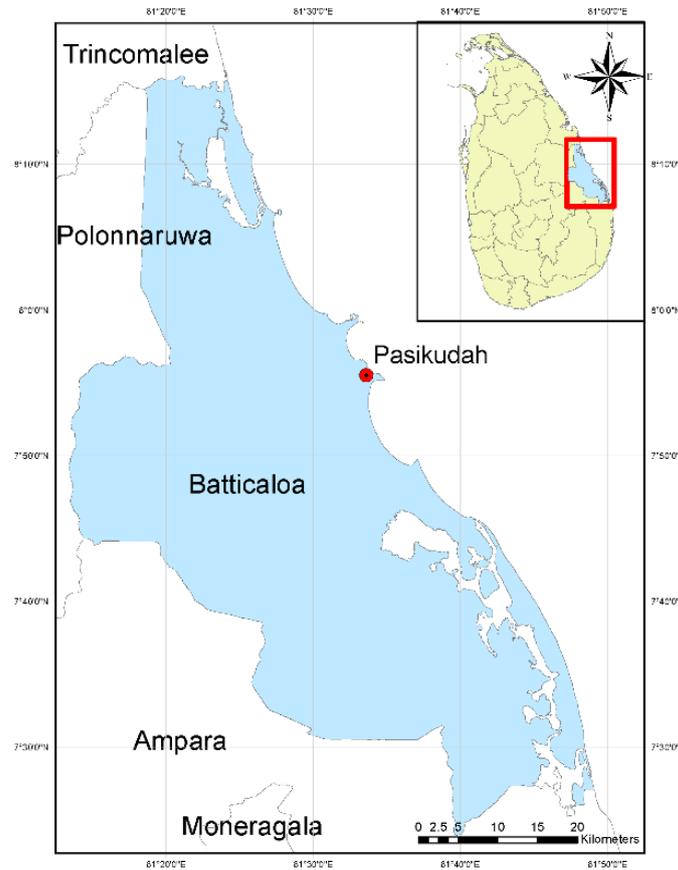


Fig-1 : Study area: Pasikudah bay

METHOD OF SAMPLING

Population for this study was local visitors who visited Pasikudah beach for recreational purposes. Sample size was 80. Sampling method used to select the respondents was two-stage random sampling. Questionnaire was pre tested prior to interview. Travel cost to and from the site, opportunity cost of time, multi-destination trip and other related socioeconomic variables such as income and age were collected. Such information was useful not only to derive demand function of the site, but also for a better understanding of the visitors' behavior. Data collection was done from August to October, 2016 to obtain suitable data for analysis. Total number of visitors for a year was calculated using the information from survey. In this calculation students and unemployed were excluded to overcome the over estimation. Weighted averages were calculated for travel cost and time for each zone and while calculating round trip travel cost, time cost was

included to obtain precise results. One of the problems faced in the travel cost analysis was that local tourists visit more than one site/trip. This problem was addressed by multiplying the weight of Pasikudah beach over whole visit.

Information pertaining to study was collected from primary and secondary sources. Secondary data was collected from Department of Census and Statistics publications and other relevant sources. Primary data required for this study was collected from the visitors at Pasikudah beach through interviews using structured questionnaire.

The completed questionnaires were checked for completeness and the collected data was subjected to analysis using the SPSS version 22.0.

Variables and their measurements

Table-1: Variables and their measurements

Parts	Variables	Measures
Personal information and Trip information	Monthly income	Rs. / month
	Employment	(employed=1, unemployed=0)
	Original starting place	Distance form Pasikudah in km
	Number of destinations	Numbers
	Number of trips taken to the beach during the past year	Numbers
	Time spent at the beach	Hours
	Party size	Number of persons
	Onsite expenses	Rs
	Opportunity cost of travel time	Rs
	Travel expenditure including the accommodation fee	Rs/ visit
	Weights on certain destinations	%

(Source: Survey data, 2016)

Theoretical background: Application of the Zonal Travel Cost Approach

Zonal travel cost method was applied to estimate the recreational value of Pasikudah Beach by collecting information based on the number of visits to the site from different distances. The first travel cost technique originated in 1947 in a letter form written by Harold Hotelling to US National Park Service, the purpose of it was to show that the benefits brought from a park exceed the cost to the visitors [5, 6]. Later in 1959 Clawson explicated this concept in more detail, which brought TCM in economic literature formally [7, 8].

Estimation of total economic benefit by aggregated rip generation function (Integration method)

To estimate the total economic value the aggregated trip generation function was used. Aggregated trip generation function; $Q = \sum_i^m N_i f(TC_i, p)$ where m=number of zones, N_i =population of zone i, TC_i =travel cost from zone i to the beach, p= entry fees (in this study the entry fees to Pasikudah beach was free). Following steps were used to derive trip generation function to estimate the zonal travel cost method. The first step was determining zones for study area

Zones of Estimating Recreational Value

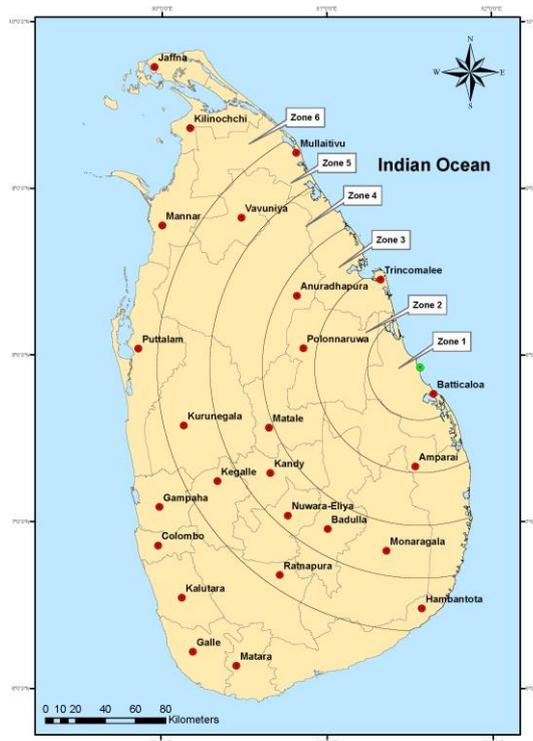


Fig-2: Zones of Estimating Recreational Value

The visitors of Pasikudah beach were divided into 6 zones according to their distance to Pasikudah beach. It was shown in figure 2. Defining zones were decided by concentric circles around the site and by geographic divisions around the site. In this study the concentric circle width was 40 km. The second step was used to collect information on the number of visitors from each zone, and the number of visits made in last year. It was calculated by using party size of sample respondents. The number of visitors in each zone during data collection period was projected to get number of visitors/year. The visitation rates/1000 population in each zone was calculated in the 3rd step. This was calculated by dividing the total visits/year from the zone by the zone's population in thousands. The average round-trip travel distance and travel time to the site for each zone were calculated in the 4th step. Using average cost/kilometre and the travel cost/trip was calculated and it was assumed that the people in Zone 0 (Pasikudah beach itself) have zero travel distance and time and each other zone have an increasing travel time and distance. The average round trip travel cost was calculated separately for each respondent was sum up to find out each zones separately.

Subsequently estimation using regression analysis, construction of demand function and estimation of recreational valuation were done as steps 5,6 and 7 [9].

Round Trip Travel Cost Estimation

Different costs were analysed to find out roundtrip travel cost. The trip cost to the beach (cost of the round trip) consists of five parts together namely travel cost, accommodation fee, access fee, other expenditures and time cost. Hence, the expression is showed in the following equation:

$$Tc_r = tcr_p + ac_p + prk_p + ex_p + tcs_p$$

Where,

- Tc_r is the total trip costs,
- tcr_p is the travel cost,
- ac_p is accommodation costs,
- prk_p is the parking cost,
- ex_p is other expenditures in beach,
- tcs_p is time cost.

All transit expenses were included in travel cost tcr_p . In travel cost method estimations multi destination visit by a visitor was a common problem. Since Pasikudah was not the only destination in the trip for most of visitors, the travel cost allocated to Pasikudah was considered by multiplying the weight of Pasikudah within the entire trip by the total travel cost.

Moreover accommodation fee (ac_p), other expenditures in beach (ex_p), parking cost (prk_p) and time cost (tcs_p) was included in calculation. Any recreation trip will consume time, part on traveling, and part on entertainment. In the trip cost, time cost consists of the time spent in traveling to and from the site and time consumed on the site. Time cost was estimated in the wage-based method which usually relates time to a person's wage [10,11].

Linear regression model for zonal travel cost calculation

Estimation of demand function for the average visitor by using regression analysis was done. In this simple model, the average visitation rate / 1000 population from each zones defined as dependent variable and average round trip travel cost / each zone was used as independent variable. To maintain the simplest possible model, it was calculated only with the travel cost and visits/1000.

$$Y_i = \beta_0 + \beta_1 X_1 + e_i$$

β_0 = Constant term

Dependent variable:

Y_i = Visitation rate / 1000 people in zones

Independent variables:

X_1 = Round trip travel cost / zone (Rs. / visit)

e_i = Disturbance term /Error term

Construction of demand function

The linear regression model (trip generation function) was used to calculate the total visits to Pasikudah / additional entry fees. The demand function for visits to the site was constructed by using the results of the regression analysis. The first point on the demand curve was the total visitors to the site at current access costs (assuming there is no entry fee for the site). The other points were found by estimating the number of visitors with different hypothetical entrance fees.

Estimate the total economic benefit

The consumer surplus (CS) is the difference between the estimated demand prices and the actual expenses that the visitor incurs during the whole trip. The aggregate consumer surplus was estimated. The total economic benefit of the site to visitors was estimated by calculating the consumer surplus, or the area under the demand curve as the final step.

$$Consumer\ surplus = \int_0^{\infty} \sum_{i=1}^m N_i f(TC_i + p) dp$$

RESULTS AND DISCUSSION

Round trip Travel cost of Pasikudah beach (N=80)

Round trip Travel cost of Pasikudah beach for a respondent was calculated by estimating their expense

on travel cost to Pasikudah, time cost to Pasikudah, accommodation expenses, parking cost and other

expenses incurred in Pasikudah.

Table-2: Costs incurred in Pasikudah Beach Visit (N=80)

Expenditure (Rs.) (per person per visit)	Minimum	Maximum	Mean	Std. Deviation
Travel cost to Pasikudah	25.00	2000	357.35	430.21
Time cost on Pasikudah beach visit	-	1333.33	269.9693	303.11
Accommodation expense	-	3000.00	140.27	447.84
Other expense on beach site	50.00	2500.00	239.57	382.71
Parking expense on beach site	0.17	50.00	9.77	6.78
Roundtrip Travel Cost	45.00	4220.50	989.40	932.66

(Source: Field Survey Data, 2016)

According to Table 2. Mean travel cost incurred to visit Pasikudah beach was estimated as Rs. 357.35/- . It ranges between Rs. 25.00/- and Rs. 2000/- . Data revealed that Rs. 269.96/- was averagely spent by a respondent as time cost. In time cost analysis only employed respondents were included, therefore except employed respondents others time costs were assumed to be zero. Meanwhile time cost ranged between 0 to Rs. 1333.33/-

Parking cost incurred in beach trip was estimated as Rs. 9.77 / person and it ranged between Rs. 0.17/- to Rs. 50.00/- . While estimating accommodation cost to a person in day / visit, it was found that the mean accommodation cost was around Rs. 140/- and it ranged between 0 to Rs. 2500.00/- . Similarly, other expenses made on Pasikudah beach were calculated / visit. Mean value for a person spent on other expense was Rs. 239.57/- . It ranged between Rs. 50/- to Rs. 2500.00/-

Round trip travel cost was estimated by sum-up the travel cost to Pasikudah, time cost to Pasikudah, accommodation expenses, parking cost and other expenses incurred in Pasikudah beach. While estimation it was found that the minimum round trip travel cost was Rs. 45.00/- and the maximum value was Rs. 4220.50/- . Therefore the mean value for Pasikudah beach visit was estimated as Rs. 989.40/- for a person / visit to Pasikudah.

RESULTS OF REGRESSION ANALYSIS

According to results shown in Table 3, linear regression model was selected to interpret the results for straight forward results. In linear regression estimation, round trip travel cost and constant value were statistically significant with the independent variable, annual visitation rate / 1000 population to Pasikudah beach. In this model, adjusted R² was 0.65. It revealed that about 65% of the variation in the visitation rate of Pasikudah beach was explained by the round trip travel cost incurred to visit Pasikudah beach.

Table-3: Regression Analysis Results (Linear Model)

	B	Std. Error
(Constant)	10.846 **	2.248
Round trip travel Cost of visit	-0.0056 *	0.002025
Dependent Variable: Visitation rate / 1000 population / annum		

(Source: Data Analysis SPSS Output, 2016) (N=6, R²=0.724, Adj. R²=0.654 F=7.552*)

(** p < 0.05, *p < 0.1)

The model was statistically significant since the p value of F- test was significant at 10% significant level. In this model round trip travel cost and total monthly income of family were affect the model at 5% significant level. It was proven that the visitation rate to Pasikudah beach / year was negatively significant with round trip travel cost. The linear model provides the following trip generated function for estimating the demand curve-

$$visitation\ rate\ per\ 1000\ population = \beta_1 + \beta_1 travel\ cost$$

By replacing model values to above equation
 $visitation\ rate\ per\ 1000\ population = 10.846 - 0.0056\ travel\ cost$

According to equation, if the travel cost was increased by 1 rupee the visitation rate was expected to decrease by 0.0056 times.

Construction of demand function

According to trip generation function, visitation rate / 1000 population=10.846 -0.0056 travel cost (in other words VR=.10.846 -0.0056 TC). The first

point on the demand curve was the total visitors to the site at current access costs (there was no entry fee for the site) which was 68,744 visitors / year. The other points were founded by estimating the number of

visitors with different hypothetical entrance fees (assuming that an entrance fee is viewed in the same way as travel costs).

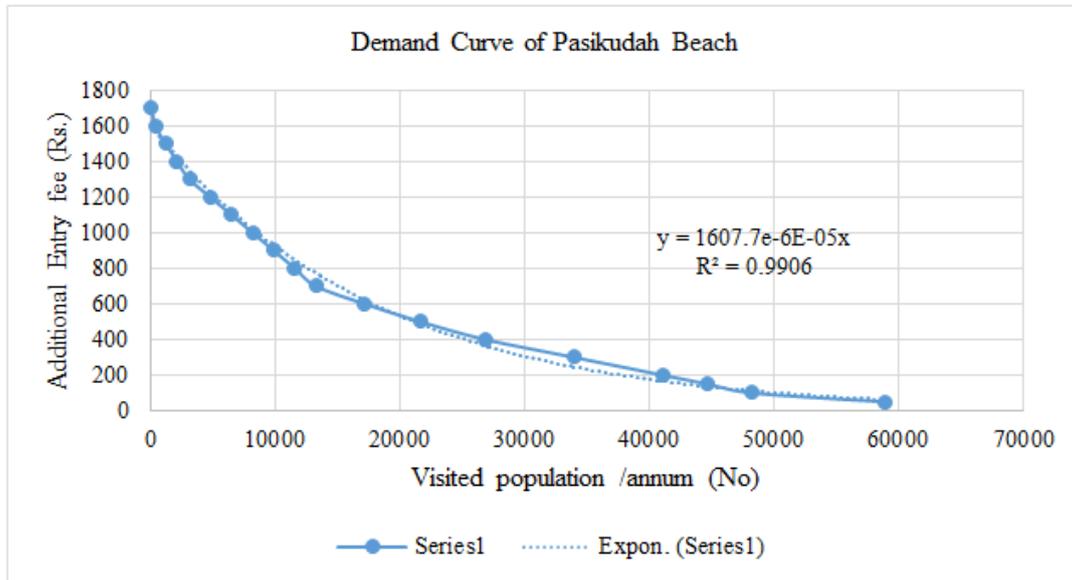


Fig-3: Demand Curve of Additional Entry Fee to Pasikudah Beach and exponential curve model fit
(Source: Drawn by Author, 2016)

According to the exponential equation, the fitted curve R^2 was 0.99 therefore the curve was 99 % accurate.

The total economic benefit of the site to visitors was estimated by following equation. The following integration was used to calculate the area under demand curve, which gives consumer surplus.

$$Consumer\ surplus = \int_0^{\infty} \sum_{i=1}^m N_i f(TC_i + p) dp$$

$$y = 1607.7 * e^{-0.00006 * x}$$

$$Recreational\ Value = \int_0^{68744} \sum_{i=1}^m N_i f(TC_i + p) dp$$

The above equation was given the area under the demand curve which was equal to the total economic value of Pasikudah beach under different hypothetical entry fees. Therefore, the recreational value of the site was around Rs. 26,361,843.21 per year or around Rs. 383.47 per visit by a person per year.

CONCLUSION

Visitation rate / year to Pasikudah beach was significantly and negatively influenced by round trip travel cost. Total economic benefits from recreational uses of the Pasikudah beach was estimated around 26 million / year.

However, the TCM only captures the recreational value. The total economic value could be

many times higher than this. Therefore alternative methods of valuation such as Contingent Valuation Methods should also be used to assess the correct value. It is worth emphasizing that these valuations do not provide complete answers to natural resource use questions but they do provide useful information and insights to improve the decision making process.

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