162

An Estimation of the Recreational Value of "Bopath-Ella" in Ratnapura: A Travel Cost Approach

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ABSTRACT. *The recreational services provided by the natural resource systems to mankind are fast being recognized. However, the knowledge on valuing the flow of recreational services and creating a demand for ecological services is comparatively less explored in developing countries such as Sri Lanka. The recreation value of Bopath-Ella was estimated using the travel cost method in this study. Data on travel cost and related information were collected from randomly selected 86 visitors to the site from December 2004 to April 2005. The zonal travel cost method was employed as an economic tool. The estimated total recreation value was Rs.120 million per year. Using discount rates of 8% and 6%, the present values of total consumer surplus were Rs. 1,820 million and Rs. 2,000 million per year, respectively. This means that the unit value of the area (70 km^2) is about Rs. 28.5 million. Such value is 7 to 10 times the purchasing price of agricultural land (Rs. 30,000 per acre), which was estimated through the survey for non-agricultural uses and is higher than the commercial land value price in rural areas. Thus developing Bopath-Ella as a recreational site is more profitable. Launching of educational campaigns about the importance of natural falls and the biodiversity with the implementation of conservation activities would enhance the successful preservation of the natural beauty of the country.*

INTRODUCTION

The recreational and ecological benefits of preserving wilderness, reserving national parks, improving water quality in lakes and rivers and similar public goods have been widely acknowledged. Sri Lanka is a country rich in bio diversity and it has many beautiful sites, which people use to spend their leisure time. Tourism is one of the main sectors that earns foreign currency for Sri Lanka. Tourists' arrivals in 2004 were 566,202 and gross tourists receipts were Rs. 41,790 million in that year. The total employment related to tourism was 129,038 in 2004 (Central Bank of Sri Lanka, 2004).

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) paradigm 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 (Randall, 1987). One of the popular

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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.

Bopath-Ella is a beautiful waterfall in the Ratnapura district. It is located in a small village called Agalawatta, which is 4 km away from the Ratnapura - Colombo road. Erathna ganga which starts from the "peak wilderness'" at Sripada mountain, creates this beautiful water fall. The shape of the waterfall resembles a leaf of the Bo tree. Therefore it is named as Bopath Ella. From this 30m high water fall, water flows to Kaluganga through the Kuru ganga. There are many fauna and flora species in this eco-system. Some of them are indigenous species (Werawardhana, 2001). Bopath-Ella is located in the high country resort region (Department of Survey, 1988). Over the last ten years, Bopath-Ella has been a major visiting place in Ratnapura district. After this site was opened to the public, it has become a famous waterfall not only in the country but also internationally. The demand to visit Bopath-Ella has increased in recent times due to security problems in the North and East area and due to the impact of tsunami in many parts of the coastal region of Sri Lanka. As a result of increasing number of tourists, a market has developed for supply of services for them. There are more than fifty stalls and two hotels at this site. Kuruwita Pradeshiya Sabha, which manages this site, is facing problems in allocating funds to maintain the facilities of the site. Estimating the recreational and other values is imperative due to misallocation of resources and conflicting views of individuals regarding conservation of the site. In the light of this situation the general objective of this study was to estimate the recreational value of Bopath-Ella. The specific objectives of this study were to determine the recreational value (which is part of total economic value) of Bopath-Ella using the travel cost method, to identify the socio-economic variables affecting travel cost and provide useful information and insight for environmental management.

METHODOLOGY

Past studies on valuation of recreational benefits

The travel cost method (TCM) is designed to measure the value of benefits people enjoy from visiting a recreation site in monetary terms. The method is based on the relationship that exists between the non-market use value and the market goods and services that are purchased as complements to a site travel cost in this case. Two main variants of the TCM are the zonal travel cost method and the individual travel cost method. The TCM has been extensively used in the USA and to a limited extent in the UK and Australia. Several applications of TCM have been reported in developing countries (Herath, 1999). Application of TCM in Sri Lanka and other countries has been reviewed recently by Gunathilake (2003).

Recreation value provides useful information for management. This value may differ according to the estimating method. However it can be used to give an idea about the

value of the site. For example, the recreation value of Lake Mokoan in Victoria, Australia, was estimated by the zonal travel cost method as US $10 000 per year and is lower than the value obtained by the individual travel cost method (Herath, 1999). Although values are different, they can be used as upper and lower bounds for planning.

Recreation value can be used to predict the success of environment improvement. The recreation value of East Lake in Wuha of China was estimated by using the travel cost method under existing water quality. It showed that improvement for boat riding will improve consumer surplus significantly (Yaping, 1998). This study shows that the travel cost method can be of use in estimation of non-marketable environmental services in developing countries.

In Sri Lanka, De Silva and Kotagama (1997) estimated the optimum park entrance fee for the Udawalawa National Park and was estimated to be Rs. 69.50. The current fee is three times lesser than estimated fee. It was also found that if this fee is charged, the total number of visitors would decrease by 47% and revenue would increase by 204.5%. Herath and Nissanka (2003) estimated the recreational value of Udawattekele. The estimated consumer surplus for the year 2001 was Rs. 7.9 million and they concluded that the park entrance fee can be increased considerably from the present per capita entrance fee. However, it would disallow poor visitors access to the park. Senaratne *et al.*, (1993) used willingness to pay approach for the Peradeniya Botanical Garden and found that the benefit can be improved through education and not from improving the income of the visitors. Kariyawasam (1992) studied the Sinharajaha reservation, and found a very low fee and concluded that developing countries cannot assign high values as developed countries. De Silva and Kotagama (1997) showed that the traditional approaches in national income accounting neglect the value addition by natural resources and natural capital depreciation. Marasinghe (2002) by using the zonal travel cost method estimated the recreational value of Yala National park. In this study he justifies incurring more money to conserve those national assets, where the visitors could bear the cost as they generate a higher utility for their money. Gunathilake and Vieth (1998) estimated the recreational value of the Pinnawela Elephant Orphanage. According to their study, the total scenic value of the elephants at the Pinnawela orphanage is estimated to be Rs. 12.2 million per year. A preliminary assessment of scenic value of elephants by foreigners showed that local travel cost component was very small compared to that of air travel. Foreigners' total recreational value is estimated to be Rs. 2,364.9 million per year. More recently, Bandara and Tisdell (2003) assessed the willingness to pay to conserve the elephant in the wild in Sri Lanka. In their analysis the largest portion of the TEV of the Asian elephant consists of their non-user value, particularly their existence value.

Consumer theory of TCM

The basic assumption of travel cost is that visitors visit only a single site. The basis of this method is as follows: If an individual's utility depends on the total time spent at the considered site, the quality of the site, and the bundle of other commodities, then the individual visitor would maximize the following utility function:

$$\text{Max}: U = U(X, r, q) \qquad\qquad (1)$$

Subject to the monetory and time constraints:

$$M + p_w . t_w = X + c . r \qquad (2)$$

$$\text{and } t^* = t_w + (t_1 + t_2)r \qquad (3)$$

Where:

U = utility	t_w = hours of work
X = the bundle of other commodities	c = monetary cost of a trip
r = the number of visits to the recreational site	t^* = total discretionary time
q = an index of quality of the recreational site	t_w = hours of work
M = exogenous income	t_1 = round trip travel time
p_w = wage rate	t_2 = time spent at site

The assumptions of TCM are the number of visits to the recreational site (r) and an index of quality of the recreational site (q), which are complements in the utility function. A individual is free to choose the time spent at work and work does not convey utility or indirect disutility; monetary cost to the site is consists of the admission fee and the monetary cost of travel (where pd is per kilometer cost and d is the distance).

Substituting (3) into (2)

$$M + p_w . t^* = X + |\, c + p_w . (t_1 + t_2)\, |. r \qquad (4)$$

Equation (4) shows that the individual income is spent totally on consuming a bundle of other commodities and a visit to the recreation site. The income has two components, exogenous income and the potential income, that could be generated by allocating all the available time for work.

Therefore; the utility maximization problem of the individual can be shown as;

$$\text{Max: } U(X, r, q)$$

$$\text{S. t: } M + pw . t^* = X + |f + P_d . d + p_w (t_1 + t_2)| \qquad (5)$$

The Lagrangian function of the maximization problem is:

$$L = U(X, r, q) + \lambda (M + p_w . t^* - |X + r\{ f + p_d . d + p_w (t_1 + t_2)\}|) \qquad (6)$$

Where: f = entrance fee
p_d = cost per kilometer
d = travel distance in kilometers

The first order necessary conditions are,

$$\partial u / \partial x = \lambda. \qquad (7.a)$$

$$\partial u / \partial r = \lambda \{ f + p_d . d + pw(t_1 + t_2) \qquad (7.b)$$

$$M + p_w \cdot t^* = X + r \{f + p \cdot d + p_w (t_1 + t_2)\} \qquad (7.c)$$

Where:

λ is the marginal utility of money income.

The maximization of utility equation subject to the constraint equation results in the individual's demand function for visits.

$$r = r(p_r(f, p_d, d, p_w, t_1, t_2), M, q) \qquad (8)$$

Change in value is measured by the consumer surplus which is obtained by integrating the demand function (8) over the range of incurred current price to the choke price when no visit is likely. If a more precise definition of welfare is adopted, the value of a recreation site should be measured as the area under the compensated demand curve. Since the compensated demand curve cannot be observed, the observed Marshallian demand curve is used to estimate the value. However, the surplus provides a close approximation when the income effects are not very significant. As is clear from the development of the basic model, we measure only the recreational value attached to the site using the travel cost method. There are two possible ways of estimating the equation (8). First, individuals can be surveyed to find the number of visits they actually made to the site during the specified period of time, travel cost, time cost and individual characteristics. The second method known as the zonal travel cost method, aggregates the data by geographical zones and calculates a visitation rate as proxy for r. This model is derived for an individual, and estimating the demand function requires time series data on the number of visits of each visitor. Since it is difficult to collect such a data set, zonal travel cost method was used in this study.

In the Zonal Travel Cost Method, the area surrounding the recreation site is divided into areas (zones) for which estimated resident population data are available at various distances from the site. In this study, ten administrative districts were considered as zones. Other districts were excluded since the number of visitors from these were very low or zero during the period of the study. Average travel cost and time cost for different zones were calculated using the data from the questionnaire survey. It was assumed that the visitors from one zone have the same characteristics. The regional visit rate was assumed as a proxy for the quantity demanded for recreation. The visit rate and the travel cost have a negative relation in congruence with the law of demand. Thus, a demand function for the un-priced recreation was estimated taking the visitation rate and travel cost. The estimated demand function could be used in calculating the consumer surplus, which is equal to recreation value of the site. Consumer surplus is equal to the area under the demand curve, which is calculated assuming that the demand is linear. In absence of an entrance fee, the entire area under the demand curve was considered as the consumer's surplus for recreational value. Total recreational value can be estimated by adding consumer surplus of all zones. This welfare value measure is the annual benefit of the recreational site. The economic value of the recreation site is the present value of the benefit stream that occurs during the life span of the site.

Data collection

Eighty-six randomly selected visitors were interviewed at the site by using a structured interview schedule. Given the controversy that shrouds the travel cost method, much attention was paid to the survey instrument such that system errors and biases would be kept at a minimum through careful research design. In order to see whether the right questions were asked and appropriate information was gathered for meaningful analysis, a pilot survey was undertaken. Travel cost to and from the site, opportunity cost of time, multi-purpose trip, types of uses of the visit and other related socioeconomic variables such as income, education, age, and sex, and the likeness towards environment were collected. Such information was useful not only for a better understanding of the visitors' behavior, but also for projection of demand for improvement and preservation of the site. The survey was conducted during the month of December 2004 and April of 2005. Data were collected during holidays and weekdays. Number of visitors was counted during 10.00 a.m. to 5.00 p.m. during the day. Total number of visitors for a year was calculated using the above information, which were about 114,696. In this calculation school children were excluded to overcome the over estimation. Based on the visitors' report on means of transport, three types of transport for distance travel were used: cars, public bus and private vehicles. Weighted averages were calculated for travel cost and time for each zone. One of the problems faced in the travel cost analysis was that local tourists visit more than one site per trip and purpose of visiting was mixed with meeting relatives and friends. In our basic model we disregarded this possibility. Since the sites were on the way to the Bopath-Ella we used the proportion of the total time spent at a site to determine the proportion of travel cost for that site.

RESULTS AND DISCUSSION

Characteristics of visitors

Survey results show that over 65% of the respondents visited frequently; and 28% visited only once in a year (visitors from far away districts). The major purposes of repeat visitors were enjoying the unique scenic site and celebration of holidays, which were highly seasonally concentrated. Among the 86 visitors, 90% were actually tourists; the others were there for various other purposes. Most of visitors are educated. Ninety percent of the sample has studied at least up to G.C.E. (O/L). The schooling years of the visitors were higher than the national average (12 years), and about 30% had some higher education. Nearly 55% of visitors earn less than Rs.10,000 as monthly income. Low income earners in Kuruwita, Eheliyagoda, Parakaduwa and other close villages use this site as recreational site because their travel cost is rather less than others from long distance such as Kurunegala, Galle etc. However, most of the visitors from a long distance are rich. Normally they use their own vehicles. The age structure suggests that over 80% of the visitors fall in the working group. Two third of the visitors were male. It was observed at the recreation site that there were significant numbers of school children. Most of the visitors were interested about the environment (about 86%). Interview with visitors highlighted that nearly 60% are concerned with improving the cleanliness of the site. It was clear that the visitors enjoyed considerable recreational benefits from this site. Improving the quality of the environment is important to attract more visitors to this site.

Visitation rate and demand curve

The relationship between average travel cost and visitation rate was used to derive a demand curve for recreation in this analysis. Visitation rate was calculated as Visitation rate (V_t) = No. of visitors from zone/Population of zone.

The total number of visitors, visitation rate and total travel cost by zones are presented in Table 1. The highest number of visitors was recorded from the Galle district while the lowest is from Kalutara and Gampaha districts. The highest number of visitation rate is also recorded from the Galle, Ratnapura, Kurunagala, Colombo, and Kegalle districts. As distance increases, the visitation rates decrease drastically from 23 per 1000 in the inner most zones to 1.19 per 1000 in the outermost zone.

Table 1. **The total number of visitors, visitation rate and total travel cost by zones for Bopath-Ella**

District	Population	No. of visitors	Visitation rate x 1000	Avg. Travel cost (Rs.)
Ratnapura	1,008,164	75	16.775	177.630
Kegalle	779,774	34	09.932	286.67
Kaluthara	1,060,800	56	01.190	434.75
Kandy	1,272,463	46	08.152	438.50
Kurunegala	1,452,369	.69	14.902	518.14
Polonaruwa	359,197	16	10.044	526.00
Galle	990,539	102	23.220	537.14
Colombo	2,234,289	85	08.578	603.65
Gampaha	2,066,096	17	01.855	705.00
Puttlum	705,342	53	03.907	826.00

Using visitation rate as a dependent variable and travel cost as an independent variable, three types of regression models were fitted to find the best-fit functional form. Forms tested included the linear, log linear and double log models. The estimated equations are reported in Table 2, where b_0 is the constant term and b_1 is the coefficient for travel cost. The linear demand curve has the highest R^2 (0.57%) and this could be considered as an acceptable level of goodness for a cross sectional study.

$$\text{Visitation rate} \quad V_r = 21.2 - 0.01875 \ Tc$$
$$(19.42) \quad (0.01275) \qquad R^2 = 0.57$$

Table 2. Regression statistics of the functions relating visitation rate and travel cost

Model	Regression Statistic		
	b_0	b_1	R^2
Linear	21.19 (19.42)	- 0.01875(0.01275)	0.57
Log-linear	45.92 (31.22)	- 13.51(11.67)	0.14
Double log	2.985 (1.890)	-0.7064 (-1.13)	0.13.

Figures in parenthesis are standard errors

The regression model was free from multicolinearity. This is evident from the correlation matrix values of less than 0.6. Therefore, the regression results qualify to be used for further inferences about the recreational benefits of Bopath-Ella. Travel cost is highly significant at 1% level. Thus the empirical evidence is compatible with the postulated economic theory.

Recreational value of site

Regression function for each zone was multiplied by zonal population. Therefore V_t was transferred into number of visits. Finally demand curve was derived and total consumer surplus was calculated as recreational value and the results are shown in Table 3.

Table 3. Zonal demand curves and consumer surpluses

District	Intercept	Slope	Consumer Surplus Rs./Year
Ratnapura	1031.1170	-0.0528	10,075,693
Kegalle	1037.1862	-0.0682	788,515
Kaluthara	863.5638	-0.0501	7,436,186
Kandy	1109.8404	-0.0418	14,773,098
Kurunegala	1177.377	-0.0367	18,925,023
Polonnaruwa	850.5320	-0.1481	2,442,540
Galle	1114.6436	-0.0537	11,568,352
Colombo	1248.1968	-0.0238	32,721,510
Gampaha	764.0957	-0.0258	11,338,978
Puttlum	1230.5851	-0.0754	10,040,397
Total			120,109,296

Total recreational value is Rs.12 million per year (Table 3). Time cost was included in travel cost. Analysis was done from data from local visitors only. Because of Tsunami, foreign visitors were very low in the period of survey and they were excluded from the analysis. But a large number foreigners come to the site in a normal year. Therefore this value is smaller than the value of a normal year.

Most trips are multipurpose trips. Therefore time cost and travel cost were calculated as percentages of total cost of the trip. When the time cost is calculated, daily income of the visitor also should be considered (opportunity cost). Since people enjoy during travel by singing and drinking one can argue that it is not a cost. However in this analysis it is considered as a cost.

Using discount rates of 8% and 6%, the present values of total consumer surplus were Rs. 1,820 million and Rs. 2,000 million, respectively. This means that the unit value of the area (70 km^2) is about Rs. 28.5 million. Such a value is 7 - 10 times the purchase price of agricultural land (Rs. 30,000 per acre) for non-agricultural uses, and is higher than the commercial land value price in rural areas. The estimated recreational value of Bopath-Ella is much higher than recreational value of Udawattekele estimated by Herath and Nissanka (2003). This was due to the fact that most of the visitors (44%) from the surrounding areas had visited Udawattakele whereas Bopath Ella attracted more visitors from out stations (86%) such as Galle Colombo, Kurunegala and Kaluthara. This indicates that developing Bopath-Ella as recreational site is more profitable. Therefore this site must be conserved as a recreation site and managed to earn money without damaging the existing eco system.

Factors affecting travel cost

Multiple regression model was tested to see if other factors affected demand. The results are shown below. The coefficient of determination in the equation is 0.64.

$$Tc = 305 \quad - \quad 3.75Ag \quad + \quad 8.7\,Fm \quad + \quad 17\,Int + \quad 0.0104\,In \quad - \quad 89.3\,Nvt$$
$$(393.9) \quad (4.963) \quad (33.91) \quad (14.31) \quad (0.0042) \quad (-2.66)$$

$$R^2 = 64.7\%$$

Where: Tc = Total travel cost
Ag = Age
Fm = Number of family members
Int = Environmental index
In   = Monthly Income
Nvt = Number of visits per year

A scale was prepared to test interest in the environment based on the visitors' degree of perception such as very interested, interested, neutral, no interest and completely not interested. The selected fields of environmental interest were; Visiting natural water falls; Watching birds and animals; Visiting natural herbarium; Responsibility about protection of natural resources; and Leadership for environmental conservation. According to the results of the regression analysis, family size, likeness towards environment and monthly income are positively related with travel cost. Expenditure of a household is higher due to children and the young spending extra amount of money for toys, sweets and other food at the site. Age and number of visits per year are negatively related to the travel cost. Because of the low travel cost, visitors from close areas visit the site more than visitors from outstations. Therefore travel cost and number of visits per year are negatively related. Age did not seem to have much impact on the TCM valuation.

CONCLUSIONS

From the travel cost investigation, it has been demonstrated that the land value of the environmental site is ten times higher than non-agricultural uses. The estimated consumer surplus in 2004 was Rs. 2,000 million. 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.

Travel cost was dependent on education, and the attractions of the unique environment. It was found that the increase in visitors' income alone would not generate higher demand for the recreational sites. It is suggested that influence of education and special interest on environment are more important. The people's appreciation of Bopath-Ella could be improved by increasing knowledge regarding its value as an ex-situ scenic conservation site.

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