

An Optimal Fee for Entrance to Udawalawe National Park: An Assessment

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ABSTRACT. *This study was undertaken to assess the optimality of the present entrance fee charged by the Udawalawe National Park (UNP) management for its visitors.*

A non market environmental valuation method referred to as 'Travel Cost Method' was used to value the wildlife viewing services of the park based on the actual behaviour of the visitors. This method values environmental services using surrogate market prices which includes all the expenses incurred by the user in viewing wildlife. In the estimation, average zonal travel costs were regressed against the respective zonal visitation rates to derive the per capita demand functions for wildlife viewing. The consumer surplus of wildlife viewing was calculated by deriving respective zonal per capita demand functions.

The results indicated that the annual consumer surplus is Rs. 2.18 million for the Udawalawe National Park in 1996. Such a low amount indicates the degree of under valuation of this natural resource. All visitors agreed to pay an additional Rs. 100.00 per group basis to build up departmental fund to support additional foot and vehicular patrols operated on a sustained and regular basis in order to maintain and improve the current status of the park.

The study also revealed that the park entrance fee could be increased considerably and, to get the maximum revenue the per capita entrance fee should be Rs. 69.50. This may reduce the present visitor number by about 47%, but it will improve the total revenue by 204.5%. The decided fee should be affordable to a majority of the general public. If the government makes

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necessary policy changes to enable the Department of Wildlife Conservation to retain at least a part of revenue earned by the national park, then a part of the cost of protection and conservation and the existing facilities could be increased by self-financing them.

The current study estimates only a fraction of the total economic value of UNP and further efforts should be made to estimate the total economic value of the park to realise its value completely.

INTRODUCTION

Sri Lanka is one of the very few countries in the world that have declared more than 12% of its land under wildlife protected areas (NARESA, 1991; DWLC, 1994). As a total, Sri Lanka has 0.78 million hectares of land under the jurisdiction of Department of Wildlife Conservation (DWLC) as wildlife protected areas. Of this extent 0.467 (59.95% million hectares) are managed as national parks open for public recreation such as wildlife viewing (DWLC, 1994).

With increasing human population and resulting demand for land settlement and agriculture, national parks have come under severe threat of being converted to alternative land uses. Furthermore, government is reluctant to allocate adequate or more funds for the management of national parks, partly because from these national parks the environmental benefits are not directly monetarily realised. Therefore, proper monetary valuation of environmental services of national parks such as wildlife viewing (non-consumptive use values) could highlight the economic importance of national parks.

Due to market failures and imperfections, the market economic system does not correctly value (price) national parks. This under valuation of national parks can lead to their over use and rapid degradation. Some of the benefits of national parks such as wildlife viewing could be valued through non-market valuation techniques. Such estimated values could be used to decide appropriate user/entrance fee which could be used to finance the management of national parks.

A demand function for wildlife viewing can be estimated considering travel cost and opportunity cost of the time as a proxy of price and visitation rates as proxy of quantity demanded for the environmental services. The area under the demand curve referred to as 'Consumer Surplus' provides the total

value of the environmental service from which appropriate user fee can be estimated.

The objective of the study is to estimate appropriate user fee which gives the maximum revenue by visitors using the Udawalawe National Park (UNP).

MATERIALS AND METHODS

Study area

The UNP was declared as a national park in 1972, and it is located in the lower catchment of Udawalawe reservoir with an extent of 32000 hectares (CEA, 1995). The UNP was established to protect the immediate catchment of the Udawalawe reservoir and to provide a refuge for wildlife (specially wild elephants) displaced due to the commencement of Udawalawe Irrigation project (CEA, 1995). UNP provides residence for 21 species of fish, 12 species of amphibians, 18 species of snakes, 15 species of tetrapod reptiles and at least 184 species of birds and 39 species of mammals. Out of that, 23 endemic and 47 globally and nationally threatened vertebrate species are found in UNP (CEA, 1995).

UNP is unique among other national parks of Sri Lanka as it enables to see wildlife specially the elephants at any time of the day. The reservoir with perianal water supply and extensive grasslands with scrub vegetation provide an ideal habitat for elephants and other wild animals. The park is easily accessible being 175 km away from Colombo. Hence, UNP is highly used for wildlife viewing.

The main purpose of valuing the environmental service is to recognise it as an integral component of the ecosystem. An environmental commodity like a national park provides almost all the value categories comprising the total economic value concept. Therefore, the value of such environmental services cannot be discovered directly from the price and quantities observed in environmental transactions because people do not buy and sell such services directly. Therefore, it cannot be valued by direct market based valuation techniques. Usually a nominal, very low fee which is administratively determined rather than by market forces of demand and supply is charged as an entrance fee at national parks. Therefore, revenue collected is not a good indicator of the value of environmental services supplied by a national park.

However, people's preferences [willingness to pay (WTP)] for the environmental services such as wildlife viewing can be inferred indirectly by examining their behaviour in markets that are linked to it. Some goods and services are compliments to environmental quality, others are proxies, surrogates or substitutes for it. Peoples' preferences can be inferred by examining the prices that they pay for the benefits they apparently derive, in these closely linked markets. The travel cost method (TCM) can be used for such an examination. It uses the time and cost incurred in visiting and enjoying a natural site (*viz.*, wildlife viewing in an national park) as a proxy for the price and visitor number as a proxy for the demand for it. The TCM is a commonly used framework for estimating the demand function for recreational services (OECD, 1995).

Although people pay a nominal fee for an environmental service (*viz.*, national park), viewing wildlife is an un-priced or perhaps under-priced commodity. In the absence of direct market prices which are most commonly used in valuation, an indirect way can be used to estimate the demand function for such activity (Dixon and Hufschmidt, 1986; Hufschmidt *et al.*, 1989). Demand for an environmental service such as wildlife viewing is not infinite because there are costs involved in getting to and from the site (national park) such as the travel cost and opportunity cost of time.

Travel and time costs can be used to infer the demand for wildlife viewing in a national park together with its respective visitation rates. This approach in valuation of un-priced commodities such as wildlife viewing is known as TCM. The information on peoples' response to their travel costs (TC) is used to draw up a demand curve for the environmental service (*viz.*, wildlife viewing) and area under the demand curve is interpreted as the total benefit of the resource and it is referred as Consumer Surplus (CS) and theoretically it indicates the scope for levying charges on visitors if it is feasible.

Method

The visitors to the park were first divided into two categories such as local and overseas visitors. The overseas visitors have been omitted from the study to avoid the extremes that would come up due to their high purchasing power and other fees charged (*viz.*, transportation, lodging, entrance *etc.*) compared to local visitors.

The local visitors were grouped into three categories as follows:

1. Visitors whose objective is only to visit the park for wildlife viewing and then get back on the same day (one day principle visitors).
2. Visitors who reside in the park for viewing wildlife.
3. The people who visit the park as a component of a major journey.

The visitors of the second and third categories were omitted to avoid getting elevated travel costs and to overcome the multiple trip effect, respectively. Therefore, only the one day principle visitors who visit the park for viewing wildlife alone is considered for the study.

A questionnaire survey was under taken amongst visitors to the site. Data was collected on place of origin of the trip, number of visitors, transportation costs, miscellaneous expenses, duration of journey and time spent at site, respondent's monthly income *etc.*. Total number of visitors to the park for the year 1996 was obtained from the UNP office and populations of each district were obtained from socio-economic data (Central Bank, 1993) as secondary data.

Based on the survey data, the following steps were undertaken to construct a demand curve for wildlife viewing in UNP such as,

1. Zoning (allocating the visitors into zones of origin of the trip)
Visitors were assigned into zones depending on the places from where the trips originated and the respective administrative districts were treated as zones. The capital city of each district was taken as the starting point of the trip. The distance between the capital city of the district was treated as the distance travelled by each individual in the 'i' th zone.
2. Obtaining visitation rates for each zone
Using information on the number of sampled visitors from each zone, the total number of visitors to the park for the year 1996, and the population in each zone and the visitation rate per 1000 population in each zone was determined by using the following formulae (OECD, 1995).

$$\text{Visitation rate /1000/ year} = \frac{(V_i/n) N \times 1000}{P}$$

- where, V_i = visitors from 'i' th zone
 n = sample size
 N = total number of visitors per year
 P = population in 'i' th zone

3. Travel Cost (TTC) estimation

TTC = travel cost + opportunity cost of time

- * Travel cost refers to the direct expenses incurred by visitors in getting to and from the site including fares, fuel, fees and other incidentals (OECD, 1995).
- * Opportunity cost of time is the value of time spent on the journey including time spent at the site.

The value of time is calculated by using the following formulae:

$$\text{Value of time (Rs) / hour} = \frac{(MI / 30)}{8}$$

- where, MI = average monthly income of each zone
30 = days per month
8 = working hours per day

4. Obtaining the statistical regression

This was done to test (to explain visitation rates in terms of travel costs) the relationship between visitation rates and respective travel costs through a linear regression using MINITAB Statistical package.

5. Construction of the demand curve

If the visitation rates of the park users can be shown as a function of the 'Price' paid, for which travel cost is a proxy, the relationship can be taken as a 'demand curve' for wildlife viewing at UNP.

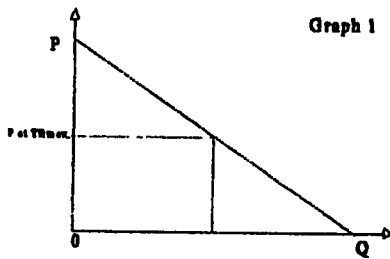
Given a demand function relating visitation rates to travel cost, the final step was to 'anchor' the data to the actual level of visits, and generate points on the demand curve by iteration.

Zonal visitation rate per thousand population with respect to travel costs were used to estimate the demand equation for wildlife viewing in UNP. The same equation was used with data on travel costs to trace out changes in demand for visits with increasing admission fees. The area under this curve is calculated assuming that the demand curve is linear between any two points. In absence of an entrance fee, the entire area under the demand curve was considered as the consumers' surplus for viewing wildlife in UNP.

Determination of price which gives the maximum revenue

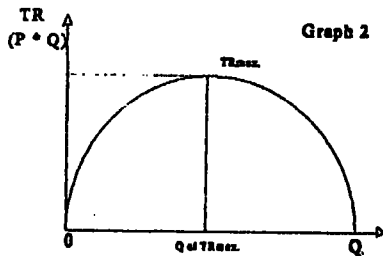
Once the actual zonal visitor number (Q) were obtained, the total revenue (TR) can be calculated by multiplying the Q by respective fee (P) (i.e., $Q \times P$).

Q is first regressed against the respective P and the appropriate regression equation was obtained. Here, when P reaches zero Q will be maximised, and when P is maximum Q will be zero. Then TR is plotted against Q to obtain the point which gives the maximum revenue (TR_{max}). This is shown in Figure 1.



a = Intercept
 b = Slope
 $P = a - bQ \dots$ (1)

$TR = P * Q$
 From graph 1,
 $P = a - bQ$
 $TR = (a - bQ) Q$
 $= aQ - bQ^2$



When TR is maximum (TR_{max})
 $\frac{dTR}{dQ} = a - 2bQ = 0$
 then,
 $a = 2bQ$
 $Q = a/2b \dots$ (2)

Figure 1. Schematic graphical expression of P vs Q and TR vs Q.

According to equation (1), Q can be calculated because a and b is given in the regression equation of P and Q. Once Q is calculated it can be substituted in the above formulae to get the appropriate price level. This is the price or the maximum revenue which should be charged as the entrance fee.

RESULTS AND DISCUSSION

Several calculations have been carried out in this study using primary and secondary data. A total of 80 visitors were surveyed and were rejected due to incomplete and inappropriate answering, and due to very high income groups. The calculated values of Total Travel Costs (TTC) and respective Visitation Rates per thousand population (VR) are given in Table 1. The total visitor number at UNP in 1996 was 33140.

Table 1. Zonal per 1000 population Visitation Rate (VR) and appropriate Total Travel Costs (TTC).

| Zone | Population '000 | # of respondents | TTC | VR |
|-----------|-----------------|------------------|--------|-------|
| Kalutara | 961 | 11 | 855.00 | 5.747 |
| Gampaha | 155 | 15 | 870.00 | 4.844 |
| Colombo | 2026 | 18 | 885.00 | 4.461 |
| Kandy | 1229 | 11 | 905.00 | 4.353 |
| Kegalle | 758 | 6 | 900.00 | 3.974 |
| Ratnapura | 960 | 5 | 925.00 | 2.615 |

Regression equation is;

$$VR = 38.8 - 0.0387 TTC \quad (3)$$

$$(R^2 = 89.4\%, R^2 \text{ adj.} = 86.7\%, p = 0.004)$$

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The actual number of visitations from each zone was calculated under varying entrance fees by using regression equation (3).

Table 2. Relationship between increasing Entrance Fee (P) with respect to actual Total Visitor Number (Q) and Total Revenue (TR).

| | Entrance fee (P) | | | | | | | | |
|----|------------------|--------|--------|--------|--------|--------|--------|-------|-----|
| | 0 | 18 | 25 | 50 | 75 | 100 | 125 | 150 | 160 |
| Q | 33849 | 33219 | 26643 | 19398 | 12152 | 5855 | 1965 | 580 | 0 |
| TR | 0 | 597942 | 666075 | 969900 | 911400 | 585500 | 245625 | 87000 | 0 |

The regression equation obtained by regressing different entrance fees (P) against the appropriate total number of visitors (Q) is given below.

$$P = 139 - 0.00395 Q \quad (4)$$

According to formulae No. (2),

$$Q = a / 2b$$

Since $a = 139$ and $b = 0.00395$ as given in (4), Q can be calculated.

$$Q = 139 / 2 \times 0.00395$$

$$Q = 17595$$

Since, $P = 139 - 0.00395 Q$ and given the $Q = 17595$,

then, $P = 139 - (0.00395 \times 17595)$

$$P = 69.50$$

This P value (Rs. 69.50) is the entrance fee which maximizes the total revenue.

Estimation of total consumer surplus/total benefit of viewing wildlife in UNP

The formula No. (3) is used with varying travel cost data to trace the changes in demand for visits or visitor numbers (Q) with increasing admission fee. The results are given in Table 3.

Table 3. Visitor numbers for each increasing entrance fee calculated by using formulae no. (3).

| Zone | TTC* | TTC for each increasing entrance fee | | | | | | | | |
|----------------------------|------|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|-------------|
| | | 0 | 18 | 25 | 50 | 75 | 100 | 125 | 150 | 166 |
| Kalutara | 855 | 837 (6150) | 855 (5489) | 862 (5228) | 887 (4299) | 912 (3369) | 937 (2439) | 962 (1509) | 987 (580) | 1012 (0) |
| Gampaha | 870 | 852 (9019) | 870 (7979) | 895 (6474) | 920 (4970) | 945 (3465) | 970 (1961) | 995 (456) | 1020 (0) | (0) |
| Colombo | 885 | 867 (10535) | 885 (9219) | 910 (7259) | 935 (5299) | 960 (3339) | 985 (1379) | 1010 (0) | (0) | (0) |
| Kandy | 905 | 887 (5530) | 905 (4641) | 930 (3452) | 955 (2263) | 980 (1074) | 1005 (0) | (0) | (0) | (0) |
| Kegalle | 900 | 882 (3593) | 900 (3009) | 925 (2276) | 950 (1542) | 975 (809) | 1000 (76) | (0) | (0) | (0) |
| Ratnapura | 925 | 907 (3552) | 925 (2882) | 950 (1954) | 975 (1025) | 1000 (96) | 1025 (0) | (0) | (0) | (0) |
| Total visitor # (Q) | | 38349 | 33219 | 26643 | 19398 | 12152 | 5855 | 1965 | 580 | 0 |

* indicates the actual Total Travel Cost (TTC) revealed by the visitors in the survey. Values within brackets indicate the total visitors from each zone under each entrance fee.

When the varying entrance fees (P) were plotted against total visitor number (Q), it gave the user demand curve shown in Figure 2.

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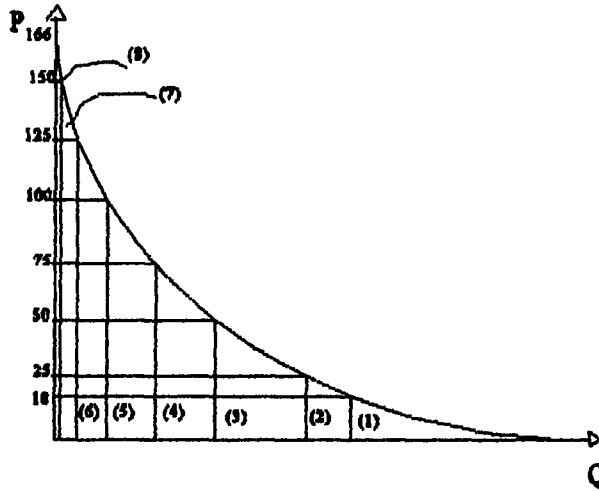


Figure 2. User demand curve for wildlife viewing in UNP.

The area under the above curve was calculated (assuming that the demand curve is linear between any two points) and illustrated in Table 4.

Table 4. Calculation of the area under the demand curve Consumer Surplus or Total benefit shown in Figure 2.

| Section | Computation | Consumer surplus (Rs) |
|---------|---|-----------------------|
| 1 | $\frac{1}{2} \times 18 \times 580$ | 46170 |
| 2 | $(\frac{1}{2} \times 7 \times 6576) + (18 \times 6576)$ | 141384 |
| 3 | $(\frac{1}{2} \times 25 \times 7245) + (25 \times 7245)$ | 271688 |
| 4 | $(\frac{1}{2} \times 25 \times 7246) + (50 \times 7246)$ | 452875 |
| 5 | $(\frac{1}{2} \times 25 \times 6297) + (75 \times 6297)$ | 550988 |
| 6 | $(\frac{1}{2} \times 25 \times 3890) + (100 \times 3890)$ | 437625 |
| 7 | $(\frac{1}{2} \times 25 \times 1385) + (125 \times 1385)$ | 190438 |
| 8 | $(\frac{1}{2} \times 16 \times 580) + (150 \times 580)$ | 91640 |
| 1-8 | User value (consumer surplus) of UNP - 1996 | 2.18 million |

Visitor perception

Almost all the respondents expressed appreciation on the efforts to protect and sustain the national park despite difficulties faced by the park management.

It was revealed by 83% of respondents that the auxiliary roads leading to water holes and better observation areas should be repaired. Most of the visitors complained that the causeway leading to Gonaviddagala is impassable to visitors who do not have jeeps or four-wheel-drive vehicles; thereby, those who cannot pass that point would lose one of the major attractive areas of the park. Further, it was requested that better toilet facilities should be made available at the stopover places inside the park (Veheragolla *etc.*). All the respondents were agreeable to pay an additional Rs. 100.00 to a departmental fund to be utilized to improve the park, for its maintenance and to keep the park at least in the same or an improved condition.

Only 5 out of 66 respondents stated that the knowledge and interpretation skills of the trackers/guides was not sufficient, but the others were satisfied about them. All respondents suggested that a continuous 'on-the-job training' of trackers/guides should be done.

Currently, what parks earn as revenues has to be credited into the government consolidated fund. Department of Wildlife Conservation should start negotiations with the government and convince it in order to retain at least 50% of the revenue that the department earned for its future usage. At the same time, Department of Wildlife Conservation should improve the prevailing visitor facilities such as infrastructure, bungalows, camp sites, water and toilet facilities in the park, and also should carry out necessary habitat enrichment programmes in the park.

Proper publicity programmes should be carried out to popularize this park among local and overseas tourists. Special efforts should be taken to popularize this park among overseas tourists because they pay comparatively a very high per capita entrance fee (*viz.* US\$ 12) than a local tourist. The Department of Wildlife Conservation should consider establishing a fund, since all the respondents of the survey agreed to pay an additional Rs. 100.00 per group basis to a fund for improving management and maintenance of the park.

CONCLUSIONS

The results indicate that the optimal entrance fee for UNP is Rs. 69.50 per person. Therefore, the present entrance fee which is Rs. 18.00 per person is an under valuation of wildlife viewing in UNP. Although pricing the entrance fee at Rs. 69.50 will decrease the total number of visitors by about 47%, it will yet maximise the total revenue of the park by about 204.5%. Along with increasing the entrance fee, the above mentioned visitor perceptions which were revealed by the survey should be considered to improve the present condition of the park and the facilities provided for the visitors.

This study assess only a fraction of the total economic value of the UNP. But, still it shows a severe under valuation. Therefore, special efforts should be taken to assess the total economic value of UNP to come up with the real value of it.

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