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14 September 2014

Online at https://mpra.ub.uni-muenchen.de/58580/
MPRA Paper No. 58580, posted 14 Sep 2014 23:37 UTC

ESTIMATING THE RECREATIONAL VALUE OF KAKUM NATIONAL PARK IN GHANA.

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Abstract

National parks and Conservational area in general play major role in human life. They serve as habitats for animals and insects, protection of water bodies, carbon sequestration, recreational sites, source of income and source of revenue to government. Notwithstanding these benefits there are reports of the destruction and degradation of the natural ecosystem worldwide. This situation has led to serious environmental problems such as loss of biodiversity, global warming, climate change and its attendant effects. If forest reserves come with so many benefits as enumerated above, why then are they being degraded?

This study sought to estimate the recreational value of Kakum national park in Ghana. To be able to give an estimate of the recreational value, an economic valuation technique called the Travel Cost method was applied. The travel cost method is a survey based method that uses

the cost of travelling to a site to estimate the demand function for the site. The data used for the study was obtained from 300 visitors to the Kakum National Park from August 12 – 14, 2013. The recreational value of the KNP was estimated to be GH¢981,188 in 2013. Based on the findings, the study recommended the following; increased advertisement of the park, provision of additional facilities at the park and public education on the importance of recreation.

Keywords: Recreational value, national park.

Introduction

According to Food and Agriculture Organization (2011), On average, almost 15 million hectares of forest were lost every year during the 1990s, mostly in the tropics. Thirty five percent (35%) of mangrove forests have been lost in the last two decades (Valiela *et al*., 2001). An estimated eleven percent (11%) of the world's coral reefs has been lost, and an additional 16 percent severely damaged (Wilkinson, 2000). Managed ecosystems such as agricultural lands have also become increasingly degraded.

Ghana is not exempted from this worldwide phenomenon. There are twenty one (21) Wildlife Protected Areas (WPAs). These include seven (7) National Parks, six (6) Resource Reserves, two (2) Wildlife Sanctuaries, (1) Strict Nature Reserve and 5 coastal wetlands. Forest resources in Ghana are being depleted at an alarming rate. According FAO (2005), mean annual rate of forest deforestation between 1990 and 2000 in Ghana is 1.7% and it even exceeded the regional deforestation rate of Africa (0.8%), Asia (0.1%) and South America (0.4%). From the country's original forest of 8.2 million hectares at the beginning of the 20th century, only an estimated 1.6 million hectares remain (Green, 1996).

Kakum National park which is one of the seven national parks is not free from not free from these growing threats to forest reserves . The Kakum National park is not free from

these growing threats to forest reserves. The threats facing the park relate to , land encroachments, chainsaw operation and poaching of which visible proof has been recorded in the form of camps, empty matchboxes, pieces of rubber tyres, used carbide, gunshots and cartridges, hunting. forest reserves are being threatened because many people do not know the economic values associated with protected area. In many cases, even the economic values associated with protected areas far exceed the monetary gains and profits from the direct exploitation of forest resources in formal markets.

There is a high probability of underestimating and undervaluing forest resources because many goods from the natural environment are not traded in markets and so have no market price . The results of this undervaluation is thus a contributing factor to the current patterns of forest use being witnessed globally and locally, that is ,the conversion of natural systems to other land uses on the basis of perceived higher financial gains associated with such activities. How do we then get the recreational value of these protected areas so as to forestall this undesirable phenomenon of converting forest reserves to other land use? The purpose of this study is to estimate the recreational value of Kakum National Park in Ghana.

Objective of the study

The general objective of the study is to estimate the recreational value of the Kakum National Park. Specifically, the study seeks to

1. Analyze the factors affecting recreational visits to Kakum National Park.
2. Estimate a recreation demand function for the Kakum National park.
3. Estimate visitor's consumer surplus for making recreational trip to the Kakum National Park.

METHODOLOGY

Sample and Sampling Technique

The population for the study was all visitors to the Kakum National Park. The sampling unit here was each individual visitor within the population. It was virtually impossible to investigate each member of the population. It would have been time consuming and very costly to investigate the entire population. For that matter, it was essential to have a sample that was representative enough of the population. To achieve the objectives of the survey, the exit poll sampling method was used. That is, visitors were given questionnaires as they returned from their experiences with the park's facilities. In this case, all visitors to the KNP during the data collection period had equal chance of being part of the sample. The data collection period was from August 12-14, 2013.

The sample size was calculated using Slovin's Formula which is written as

$n = N / (1 + Ne^2)$

Where n = Number of samples, N = Total population and e = Error tolerance

On a typical day, the number of visitors to the KNP can be as high as 1000. This gives a total of 3000 visitors to the park within the 3 days survey period. Therefore, with a confidence level of 95% and 5% margin of error, the sample size was calculated as

$n = N / (1 + Ne^2)$ =3,000 / (1 + 3000 * 0.05 2) = 352 visitors.

Econometric model specification

The data collected from the survey was data about the number of visits to the site and their different costs in reaching the site. The cost was then used to derive the demand function for the site. It was expected that the higher the cost of reaching a site is, the lower the amount of visits to the park would be, ceteris paribus. Therefore the demand curve was

expected to be negatively sloped. The trip generating function can be used differently depending on what factors and what method is used. There are two different ways in which the travel cost method can be used; the zonal travel cost method and the individual travel cost method. The Zonal Travel Cost Method (ZTCM) makes its estimations with the help of dividing individuals into different zones of origin, while the Individual Travel Cost Method (ITCM) makes its estimation by using each individual's travel cost. This study used the individual travel cost method to estimate the recreational value of the KNP since the single individual was the object unit. The individual travel cost is able to collect more information and thus provides relatively closer travel cost approximation of the true consumer surplus than zonal travel cost (Willis and Garrod, 1991). Another reason why the individual approach was chosen over the zonal approach was that it can be used for the estimations of the trip generating function with relatively smaller number of observations compared to the zonal approach (Garrod and Willis,1999). For determining the Trip Generating Function (TGF), multiple regression analysis was made between visits to the site as the dependent variable and visitors' socio-economic, cultural and demographic characteristics which are the independent variables. Mathematically:

$$V = f(C, X) \quad \text{..... (1)}$$

Where V is visits to the site, C is visit costs and *X* represents other socio-economic variables which are hypothesized to explain visits to the site.

There are many common functional forms of the TGF in the literature including linear, semi-log (log-linear) and double log model. There is no consensus in the literature on which of these is the best functional form to employ. Various criteria can be used to choose the functional forms based on: (1) theoretical assumptions about the shape of the demand function, (2) the precision with which the travel price coefficient is measured (that is, t -

statistics) and more general measures such as goodness of fit (that is, R-squared and other measures). Because many of these criteria produce contradictory rankings and because of the lack of consensus, most researchers employ several functional forms in order to see how sensitive this choice is to the final estimate of consumer surplus. The individual travel cost method trip generating function can according to Garrod and Willis (1999) be defined as:

$V_{ij} = f(P_{ij}, T_{ij}, Q_{ij}, S_j, Y_{ij})$ ..... (2)

Where, V_{ij} is the number of visits made by an individual i to site j, P_{ij} is the travel cost incurred by an individual i to site j, T_{ij} is the time cost incurred by an individual i to site j, Q_{ij} is a vector for the perceived qualities for individual i, S_j is the characteristics of available substitute sites, Y_i is the household income of individual i.

This model was adopted and modified for this study as follows:

Vij = f (TCi, AGi, Yi, Edi, ,GDi, MSi, OCi, PQi) ..... (3)

Where,

Vij= Individuals' number of visits. TC = visitors' travel cost.

AG = visitor's' age, Y = visitor's monthly income, ED = visitor's level of education, GD = visitor's gender, MS = visitor's marital status, OC = visitor's occupation, , PQ = perceived quality of the park.

The specific econometric model that was used to describe the relationship between individual visits per year and the travel cost as well as other explanatory variables is given by:

$V = \beta_0 + \beta_1 TC + \beta_2 AG + \beta_3 Y + \beta_4 ED + \beta_5 GD + \beta_6 MS + \beta_7 OC + \beta_8 PQ + \varepsilon_i$ ..... (4)

Where the βs are the parameters of the regression and all other variables are as defined.

Results and Discussion

Three hundred respondents completed their questionnaires and so analysis was based on the three hundred respondents. Out of the 300 respondents, 162 representing 54% were females and 138 (46%) were males. With regard to the age variable, the modal class was those between the ages of 18 – 28 (43.7%) 50 0f the respondents, representing 16.7% were below 18years, 47 (15.7%) or the respondents were between the ages of 29-39.14.7% (44) of the respondents were between 40-49years, 7.7% being between 50-59years just 5 out of the 300 respondents having ages from 60 and above. From table 4.2 it can be seen that about 228 out of the 300 respondents are below the 30years.This result is consistent with our intuitive expectation that young people travel to long distances to recreate in recreation sites.

The study revealed that out of the total respondents 162 were Ghanaians and remaining 138 were foreigners. These foreigners were Europe, North America, Asia and other African countries like Nigeria, Liberia, the Gambia and South Africa.

The study further indicated that out of the 162 Ghanaian respondents, about 70 of them representing 43.2% came from the Greater Accra region, 34 respondents (21%) from the Ashanti region, and 30 of them (18.5%) from the central region. 17 of the respondents (10.5%) came from the Eastern region, and 11 of them from the western region. There were no respondents from the three northern regions, the Volta and the Brong Ahafo regions.

Regression Results

Since the data for the dependent variable are integers, truncated below one visit per year, equation estimation by OLS regression is inappropriate. The regression slopes estimated

by OLS will be biased toward zero when the dependent variable is truncated (Madalla, 1983 as cited in Mahmud, 1998). The result is that the least squares method understates price elasticity and overstates consumers' surplus. Price elasticity is defined as (in this case) the percentage change in quantity demanded (trips) caused by a one percent change in money trip price (travel cost).

The most appropriate estimator then, in this case is either the truncated Poisson regression model or the truncated negative binomial regression model. Since there were no zero values in the number of visits, the zero – truncated estimates were used. The results for the robust zero truncated negative binomial regression is as presented in Table 1. The robust was added to deal with any possibility of heteroscedasticity.

Table 1: regression results for zero truncated negative binomial regression

variable	coef.	std. Err	p-value
TC	-0.458	0.242	0.000
AG	-0.256	0.336	0.000
Y	-0.0239	0.229	0.297
ED	0.477	0.061	0.000
GD	-0.0106	0.041	0.796
MS	-0.621	0.0608	0.307
OC	0.139	0.034	0.000
PQ	0.001	0.019	0.951
cons	0.226	0.354	0.523
Wald chi^2 (8) = 1252.45	prob>ch2 = 0.0000	/lnalpha = -51.69451	
Log likelihood = - 261.46982	alpha = 3.54e-23	pseudo-R^2, = 0.3071	

Writing out the linear equation of the results above gives the following trip

generating function:

$$V_{ZTNB} = 0.2266213 - 0.4583391TC - 0.2569318AG - 0.0239285Y + 0.4779875ED + 0.010645GD - 0.0621329MS + 0.1397136OC + 0.0011808PQ \ldots\ldots (5)$$

The results of the trip generating function estimated using the zero truncated negative binomial regression method seen in the table above shows coefficients of Travel cost (TC), Age (AG), Education(ED), and Occupation (OC) were statistically significant at 1%. The coefficients of the zero truncated negative binomial regression models are not explained directly as OLS estimates. In OLS, they indicate how much would be seen in the dependent variable when there is a unit increase in the independent variables. However, the dependent variable (V) in the truncated negative binomial is a count variable, and the regression models the log of the expected count as a linear function of the predictor variables. We can therefore interpret each regression coefficient as For a standard negative binomial model the exponential (exp) of a coefficient shows the expected change in the dependent variable as a result of a unit change in the predictor, holding all other predictors constant (Tang, 2009).

The negative coefficient of the travel cost (-0.4583391) was as expected. One unit increase in travel cost results in the expected number of visits to decrease by a factor of exp (-0.4583391) = 0.63233. In other words, the value of the coefficient for travel cost, (-0.4583391), suggests that the log count of visits decreases by 0.4583391 for each cedi increase in travel cost. The value of the coefficient for age, -.0.2569318, suggests that the log count of visits decreases by 0.2569318 for each unit increase in age group. The negative relationship between age and the number of visits shows that as one gets older, the number of visits to the site reduces. Perhaps, older individuals are usually settled, either working or taking up other responsibilities that may not give them enough time for leisure,

whilst younger individuals may not be engaged in a lot of responsibilities. They are usually very active, energetic and have more time for recreation. It is therefore not surprising that about 75% of the respondents were below 40 years. This coefficient as stated previously was statistically significant.

The expected number of visits will increase by a factor of exp (0.4779875) = 1.612825 as one claims academic leather. The positive relationship between the level of education and the number of recreational visits means, as level of education increases the number of visits made will also increase. The education variable is significant at 1 %. This result confirms the hypothesis that educated people have stronger appreciation for leisure and the environment than the uneducated.

The zero truncated Poisson regression model was also estimated but the results were not so much different from that of the zero- truncated negative binomial regression estimate in terms of the magnitude and signs of the coefficients. In the negative binomial regression estimate, Alpha is the estimate of the dispersion parameter, which can also be obtained by exponentiating /lnalph (Madalla, 1983 as cited in Mahmud, 1998). If the dispersion parameter equals zero, then the data is not over dispersed. If alpha is however significantly greater than zero then the data is over dispersed and are better estimated using negative binomial model. Thus with alpha being 3.54e-23 and approaching zero, it can be said that the data is not over dispersed hence the preference of the results as obtained by the zero truncated negative binomial. Appendix A shows the zero truncated Poisson regression results.

The Demand Function and Consumer Surplus

The demand function for the Kakum National Park was estimated as

$$V_{ZTP} = 0.2266215 - 0.4583391TC \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

The travel cost showed a negative value of 0.4583391, and this is in accordance

with the economic theory. That is the number of visits decrease as the travel cost increase

The individual average consumer surplus, according to Garrod and Willis (1990), can be calculated as

$$\text{Consumer surplus} = \frac{\text{Average visits}}{\text{Travel cost Applying}}$$

The results in this model gives Consumer Surplus

$$= 1.917 = \frac{\text{GH¢}4.1856.}{0.458}$$

To obtain the aggregate consumer surplus, the individual consumer surplus of GH¢4.1856 has to be multiplied by the number of annual visits. With the number of visitors to the park reaching 234,420 in 2013, it implies that the aggregate consumer surplus for the KNP in 2013, representing the recreational value in this case, was GH¢981,188 (GH¢4.1856 × 234,420 = GH¢981,188). The figure seem to be very low, and a probable cause for the low consumer surplus could be the high travel cost coefficient, since the consumer surplus is calculated by dividing the average number of visits made to the park by the travel cost coefficient. A high travel cost coefficient will therefore result in a low consumer surplus. It must however be emphasized that this figure represents only the recreational value of the park, excluding the other economic values of the park.

Recommendation

This study recommends that more advertisement should be made at all levels of schools across the country through magazines so as to increase the appetite of a lot more students and youths to visit the park. Adverts in our local languages on the various radio and television stations across the country can also whip up interest of the uneducated and old men and women to visit the park. On the part of foreigners, the park can be advertised in the social media and through a well administered website. Also brochures on the park and

other parks in the country can be made and sent to the various embassies of the country worldwide to give more information about the parks in Ghana.

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Appendix A: **Zero truncated Poisson regression Results**

Table 2: Zero truncated Poisson regression Results

Variable	coef.	std. Err.	p-value
GD	-0.0106	0.1122	0.924
AG	-0.256	0.0869	0.000
MS	-0.0621	0.1521	0.683
ED	0.4779	0.1046	0.000
OC	0.1397	0.0886	0.000
Y	-0.0239	0.0603	0.692
PQ	0.0011	0.0562	0.983
TC	-0.4583	0.772	0.000
cons	0.2266	0.7221	0.754