Economic Valuation of Recreational Benefits of Public Park in Nepal

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Abstract

This paper investigates benefit cost ratio and condition of consumers' surplus from recreational public park in Nepal. *The main objective of this study is to estimate the recreational benefits of Tikapur Banglow Park (TBP), calculation of consumers' surplus per visitor per trip of individual visitors and estimation of benefit cost ratio of the Park. The Individual Travel Cost Method (ITCM) has been employed to capture the non-market benefits of the Park. The study is based on the survey of 108 visitors of Tikapur Banglaw Park(TBP) during mid March to mid April 2014. The Poisson regression model has been used to estimate consumer surplus of the visitors. The study shows that visit rate of visitors of Park is inversely correlated with travel cost and age of the visitors and positively correlated with household income of the visitors. The mean consumer's surplus per visitor per trip is estimated to be about NPR 2475. The aggregated consumer surplus for the annual park visitors calculated to be NPR 351 million. The estimated opportunity cost of the Park in terms of agricultural production is about NPR 8.85 million per annum. The total benefit is NPR 355 million and total cost is NPR 13 million per annum. The benefit cost ratio is 27.43. The study clearly finds that the Tikapur Banglaw Park generates significantly higher level of social welfare. Therefore, Tikapur Municipality should formulate timely project intervention to upgrade quality of TBP.*

Key words: Non-market Valuation, Individual Travel Cost Method, Consumer Surplus, Public good, Count Data, Poisson Regression Model JEL Classification: C31, D11, D61, H41, Q26, Q56

Introduction

Public recreation parks are part of environmental goods and services and contribute substantially to net value addition to any society and economy as a whole. There is increasing and widespread public support for public park provision in urban areas given that they provide an array of different recreational activities enhancing the citizen's quality of life (Salazar & Defranesco, 2005). Public Parks also significantly improve surrounding environment by contributing to increasing greenery, reducing air, water, and noise pollution and helping in wildlife preservation (Ahmed & Gotoh, 2006). Since environmental goods and services are not traded in the usual markets, the benefits derived from these commodities

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are external to the market (De and Devi, 2011). In other words, public parks generate high value for human welfare, but they do not receive due consideration in public policy.

Travel Cost Method (TCM) has been developed in order to estimate social benefits from recreational site such as public park. There are two basic approaches to TCM : the Zonal Travel Cost Method (ZTCM) and the Individual Travel Cost Method (ITCM). The latter can be considered a refinement or a generalization of ZTCM. ITCM was developed by Brown and Nawas (1973) and Gom and Martin (1974), estimates the consumers surplus by analyzing the individual visitors' behaviour and the cost sustained for the recreational activities (Rosato et al.,2002).

The theory surrounding the TCM and its application is relatively straightforward. It is grounded in the microeconomic theory of consumer behaviour which states that an individual consumer maximizes his/her utility derived from the consumption of goods and services subject to his/her budget constraints. A general solution to this constrained maximization problem yields the Marshallian demand function. The application of this microeconomic theory of consumer behaviour is relatively straightforward when private goods and services have been dealt with. This analogy can be extended to public goods and services such as public parks and other recreational services. In this special case, a representative individual visitor to a recreation site is thought of as a consumer of a marketable goods and an environmental goods or recreational goods and services , namely visits to a recreational public park (denoted as v_i) and all other private goods and services (denoted as x_i), who faces budgetary and time constraints. Let's assume x_i and v_i to represent a vector of private marketable goods and a vector of recreational non-marketable goods respectively. Let again the prices of these two goods be p_x and p_v respectively. The representative consumer can therefore spend his or her income (denoted as Y_i) on the purchase of these two set of goods. Hence, the budget constraint of the individual visitors is given as

$$Y_i = w\,T_w = p_x\,x_i + p_v\,v_i \quad \ldots\ldots\ldots\ldots\ldots \quad (1)$$

Y is the income level of the individual consumer i, w is the hourly wage rate and T is the total number of hours worked. The individual visitor also faces a time constraint as he or she must decide on how much time to spend on his work and leisure (recreation).

Similar to equation (1) above, the time constraint can then be stated as

$$T = T_w + T_L \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

T is the total time endowment of the consumer that is divided into Tw yhat means time devoted for work and T_L is time devoted to leisure (recreation). It is to be noted that the quality of recreational sites is a key of the visitor's choice of the site to visit.

If we denote the quality yardsticks of a recreational site as q_j then the utility function of the representative visitors can be written as

$$U_{ij} = U(x_i\, v_i\, q_j) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

By maximizing equation (3) subject to equation (1) and (2), ordinary or Marshallian demand function for private marketable goods non-market recreational goods are obtainable:

$$X_{ij} = U(P_x P_v\, Y_i\, q_j) \quad \ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$V_{ij} = U(P_x P_v\, Y_i\, q_j) \quad \ldots\ldots\ldots\ldots\ldots \quad (5)$$

Equation (4) and (5) represent the ordinary demand functions of marketable private goods and non-marketable recreational goods, respectively. However, the focus of this work is on the latter equation (5). It is difficult to measure the flow of the recreational services (Sarker & Surry, 2004). Therefore, as a solution, the number of trips to the recreational site is used as surrogates. Therefore equation (5) is crucial in computing the consumer surplus (CS) per trip and its coefficient would be estimated using appropriate econometric tool as per the nature data of dependent variable of this study.

Review of Related Literature

The economists have developed non-market valuation technique to estimate the benefits of environmental public goods. The Concept of non-market valuation techniques originated in the 1940s. The proposal of Ciriacy-Wantrup(1947) used stated preference methods to value natural resources and the environment goods. Hotelling (1949) used travel costs to value economic benefits of national parks. In fact, there are basically two methods of the valuation of the environmental goods: the market based approach and the non-market based approach. When a market exists, it is relatively easy to apply market-based techniques to measure value. But when market information relating to price and quantities is not available to estimate the value of the resources or resources service, we use non market valuation methods. **Limae et al., (2014)** concluded that there is a significant relation between the number of visitors as a dependent variable and travel costs whereas when the travel cost increases, the number of visitors decreases. **Mathew et al., (2013)** showed that the consumer surplus value per trip for the Langkawi model €6993 is greater than for the Kilim models (€1437 and €633) for the Poisson regression analysis. **Roussel et al., (2012)** found mean consumer surplus US $ 78.03 per visitor and per trip.

De and Devi (2011) estimated consumer surplus per domestic tourist per visit is found to be Rs. 1787.46. The same for the foreign tourist is about Rs 15872. The revised consumer surpluses based on the additional willingness to pay are Rs. 1933.15 and Rs. 17292 i.e., there is an incremental consumer surplus Rs. 145.69 and Rs. 1420 respectively. **Nde (2011)** found consumer surplus estimates that are equivalent to the recreational value of the beach per trip per visitor per day and ranged from €2.56 to €41.51. Also, a possible access fee to the beach of€2.0 was suggested based on the stated willingness to pay of the visitors. **Aryal (2008)** found the total annual consumer surplus or economic benefit obtained from recreation in Chitawan National Park approximately NPR 23 million (US$ 3,421,162.7). Based on willingness to pay, the study recommended that a Park entrance fee of US$ 15 per person be introduced, which could be utilized for Park management. **Ahmed and Gotoh (2006)** study showed that the residents of the Nagasaki City are willing to pay in total 920 million yen (5,225 yen per household) for preserving the public parks in the city. The negative relationship between the persons visiting the public parks and the WTP, revealed from the multivariate analysis indicates that, non-use value of public parks in Nagasaki City is also very high. **Salazar and Menendez (2005)** found that the mean willingness to pay (WTP) is considerably higher for people who live closer to the planned park as it is more accessible to them.

Himayatullaha and Siddiqui (2003) found actual consumer surplus per visitor per trip Rs. 240 where as the total actual consumer surplus was estimated to be Rs. 24.2 million. The annual consumer surplus in case of an improved scenario was projected as Rs. 35.01 million. **Shrestha et al., (2002)** estimated the CS values from $540.54to $869.57 per trip resulting in the total social welfare estimate range from $35 to $56 million. He also approximated expected values for the semilog and linear models are $2971.14 and $ 1601.12 respectively.

The details mentioned above are mostly from foreign country. The researcher has conducted taking the Nepalese reference. In this context, the researcher has selected Tikapur Banglaw Park (TBP) the Public Park managed by Tikapur Municipality in Kailali district of Far West Nepal as a case to carry out economic valuation of the public parks in the Nepalese context.

Data and Methodology

This is a small descriptive cross-sectional study and based on single contact with the visitors of Tikapur Banglaw Park (TBP). The study area was public recreational park of Tikapur Municipality named Tikapur Banglaw Park (TBP). TBP is located towards the easternmost edge of Kailali District and at the bank of Karnali River and about 20 Kilometers southern direction from East West National Highway of Nepal. The TBP is spread along the surface area of more than 58.02 hectares of land but core park area is limited to only 6.12 hectare and remaining is covered by natural forest (Tikapur Municipality, 2014). It has been the centre of attraction to large number of tourist for last couple of years. The fascinating location of TBP at the bank of Karnali River has provided ample opportunities for visitors to entertain themselves. Furthermore, it provides them with the opportunities of swimming, boating, rafting and picnicking as well. Likewise, it has a magnificent flower garden endowed with varieties of flowers that attracts substantial number of visitors annually. This study is based on a survey of TBP visitors conducted by the researcher in the study. The primary data were collected using structured questionnaire. Besides, the secondary data were collected from other concerned authority like Tikapur Municipality, Agriculture Service Centre Tikapur, and Ministry of Agriculture Development of Nepal. The survey was conducted during mid March to Mid April 2014. The structured questionnaire covered caste &ethnicity of visitors, place of residence, income, family size, age, gender, education, employment status, travel cost, substitute site travel cost, satisfaction from park, maximum willingness to pay as entry fee. The variables were chosen to cover the objectives.

Econometric Specification of Model in Functional Form

According to Garrod and Willis (1999), the individual travel cost methods (ITCM) trip generating function can be define as:

$$V_{ij} = f(Tc_{ij}, Y_i\ Tm_{ij}, Q_i, S_j,) \quad \ldots\ldots\ldots\ldots\ldots \quad (6)$$

Where,

V = visit rate of individual' i' to site 'j'.

Tc_{ij} = Travel cost incurred by individual 'i' when visiting site j

Y_i = Household income of individual 'i

Tm_{ij} = Time cost incurred by individual 'i' when visiting site ' j'

Q_i = Vector of perceived qualities for the individual 'i'

S_j = Vector of the characteristics of available substitute sites

Model for the Consumers Surplus

The consumers' surplus is the differences between what an individual is willing to pay at most and what was actually paid for the use of a resource. According to Garrod and Willis (1999), consumer surplus can be defined as:

$$\text{Average Consumer Surplus per visitors per visit} = \frac{-1}{\beta} \quad \text{..... (7)}$$

Where, β= Coefficient for Total travel cost estimated in the model

Equation 8 will estimate the average consumer surplus or mean consumer surplus per visitors per trips. To be able to get the aggregated consumer surplus, the average consumer surplus will be multiplied by the total number of visitors to the site during a specific time period.

Econometric Specification of Model in Stochastic form

The model for trip generation function given in equation (2) has been generalized for Individual Travel Cost Method (ITCM) as proposed by Himayatullah et al.,(2003) in which three dummy variables also were incorporated to fulfill objectives of this proposed study as given in equation (4) below. In other words, the basic model used in this study depicts the number of visits to the TBP as a function of factors such as the travel cost, time spent in travelling substitutes sites, income, education, age, sex, rural versus urban residence, family size. Thus, the model has been estimated using econometric model as follows:

$$V_{ij}=\alpha_0+\beta_1 TC_i+\beta_2 Y_i+\beta_3 STC+\beta_4 A_i+\beta_5 E_i+\beta_6 FS_i+\beta_{7+k}\,\Sigma D_k+\varepsilon_i \quad \text{.....(8)}$$

Where V_{ij} =The visit rate by the 'i' th individual to the site j.

$\alpha_0, \beta_1 \ldots\ldots \beta_7$= Coefficient to be estimated.

TC_{ij} = Round trip total cost to the site including travel time cost of individual 'i' when visiting site j.

Y_i= Household income of the individual 'i'.

STC= Travel cost to and from substitute site

A_i = Age of the individual visitor 'i'.

E_i = Education level of visitor 'i'.

FS_i = Family size of visitor 'i'.

ΣD_k= Three dummy variables as follows:

D_1 = 1 if male and 0 otherwise.

D_2 = 1 if urban dweller and 0 otherwise.

D_3 = '1' if the visitor's perception about the facility is good and '0' otherwise.

ε_i = Error

Econometric Model Choice for Count Data

The TCM model contains with non-negative integer feature of the trip data which faces with issue of TCM demand model. These types of data are called count data. The Count Data models utilize data in which the observations are counted rather than ranked and the observations equally assume non-negative integer values (i.e. 0, 1, 2, 3 ...N). Based on the nature of distribution of data, generally these types of data suffer from either over dispersion or under dispersion problem. The researcher has made choice of Poisson distribution model based on CT's Test (1990). Likewise, Akaike information Criterion and Schwarz Criterion is regarded as better for model selection criteria that ensures for getting efficient and consistent estimator. These also suggested Poisson model as better. The dependent variable in this particular case refers to the trips visitors undertake to the TBP Park.

The model for running Poisson regression is as follows:

$$Y \sim Pois(\lambda = \exp(X_i \beta)), \text{ if } Y > 0 \quad \text{.....(19)}$$

Where X_i the vector of the variables affecting the number of trips and β is a vector of parameters of the explanatory variables.

Based on the CT test (1990) Poisson model has been selected to estimate the model. Cameron and Trivedi (1990) have developed CT's(1990) test to test statistically the over dispersion of the data. The general rule of the CT test is based on the assumption that under the Poisson model $\{(y-EIyI)^2 - EIyI\}$ has zero mean. The hypothesis setting can be expressed as:

H_0 : (The data of dependent variable is not over dispersed) i.e. Var $[y_i]$= $E[y_i]$

H_A: (The data of dependent variable is over dispersed) i.e. Var $[y_i]$= $E[y_i]+\alpha g(E[y_i])$

CT's general rule is that if: Var $[y_i]/E[y_i] > 2$ than over dispersion of data otherwise not over dispersion of data.

Based on Cameron and Trivedi (1990) criteria viz., CT's(1990) test, for over dispersion test of dependent variable, Akaike information Criterion and Schwarz Criterion, Poisson model is best suited for this study. This implies that there is no over-dispersion problem statistically. This means simple Poisson model also can give efficient and consistent estimation. Therefore, the researcher has made choice of Poisson model to estimate the regression model of this study.

Result and Discussion

The data in table 1 exhibits socio-economic and demographic characteristics of sample respondent sample respondents.

Table 1 Socio-Economic and Demographic Characteristics of Sample Respondent Visitors

S.N.	Variables	Quantity
1	**Mean Age (In Years)**	28.47
2	**Household Size**	5.88
3	**Gender**	
	Male	58.3%
	Female	41.7%
4	**Place of Residence**	
	Urban Dweller	59.3%
	Village Dweller	41.7%
5	**Educational Status**	
	Literate	4.6%
	Basic and Primary	17.6%

	Secondary Level	42.6%
	Bachelor	27.8%
	Masters and Above	7.4%
6	**Employment Status**	
	Student	27.8%
	Formally Employed	25.0%
	Unemployed	6.5%
	Retired	0.9%
	Self-employed	38.0%
	Daily Wage	1.9%
7	**How would you describe the quality of the park?**	
	Good	81.5%
	Poor	18.5%
8	**Perception of respondent on current entry fee based on current facility**	
	Low	15.7%
	Fair	66.7%
	High	17.6%
9	**If there is no other way but to raise the entry fee, are you ready for this?**	
	Yes	89.8%
	No	10.2%

Source: Field Survey, 2014.

Descriptive Statistics

The data given in table 2 shows that mean visitation rate is 2.44 per year per visitor. The visitors mean TC, STC and mean monthly household income are Rs. 995, Rs. 214 and Rs.15764 respectively. Likewise visitors mean years of schooling are 11.86 years. Average stay hours is found to be about 5 hours.

Table 2 Descriptive Statistics of Key Variables

S.N.	Variables	Mean	Minimum	Maximum	Standard Deviation
1	Vij	2.444	1.00	8.00	1.28
2	TC_{ij} (in Rs.)	994.55	125.00	4825.00	688.09
3	Y_i (in Rs.)	15763.90	2500.00	55000.00	8896.2
4	E_i (in Years)	11.86	.00	17.00	3.8
5	A_i(in Years)	28.47	16	55	9.54
6	Average Stay hours in Park	4.58	1.00	10.00	1.60
7	STC (in Rs.)	213.80	.00	2000.00	478.83
Total Number of Sample Respondents 108					

Source: Field Survey, 2014

Test of Multi-colinearity

The variables were included on the logic of underlying economic theory. The included variables were tested for multi-collinearity. According to Loomis and Walsh (1997), an absolute value of 0.8 signifies multi-collinearity. The correlation matrix displayed in Table 3 shows no correlation higher than 0.465, which is quite lower than 0.8 indicate that multi-

collinearity is not a problem within the data set. All the variables could initially be included in the analysis.

Table 3 Correlation Matrix of Variables

Variables	Vij	TC_{ij}	Y_i	STC	A_i	E_i	FS_i
Vij	1.000	-.419	.465	-.124	-.318	.077	.068
TC_{ij}	-.419	1.000	-.003	.208	.204	.192	.018
Y_i	.465	-.003	1.000	.021	.106	.183	.012
STC	-.124	.208	.021	1.000	.147	.125	.022
A_i	-.318	.204	.106	.147	1.000	-.139	.047
E_i	.077	.192	.183	.125	-.139	1.000	-.082
FS_i	.068	.018	.012	.022	.047	-.082	1.000

Source: Field Survey, 2014.

Estimated Result from Poisson Regression Analysis

The estimated result of Poisson regression model reports result in table 4. In this model only statistically significant coefficients are reported and most coefficients have the expected algebraic signs.

Table 4 Estimated Results of Poisson Model

Dependent Variable visit rate (Vij)

S.N.	Variable	Coefficient	Std. Error	Z-Static	Prob.
1	C	0.926	0.394	2.351915	0.018
2	TC_{ij}	-0.000404***	0.000124	-3.266814	0.001
3	Y_i	0.00002***	0.000007	3.576798	0.0003
5	A_i	-0.016**	0.0074	-2.114611	0.034
6	Total number of observations 108.				

Note: Double asterisk ** and triple asterisk *** imply coefficient significance at 5 percent and 1 percent level respectively.

Source: Author's own calculation

R-squared	0.61
Adjusted R-squared	0.57
Darwin-Watson	2.168
Akaike Information Criterion (AIC)	3.108
Schwarz Criterion (SC)	3.356
Log Likelihood	-157.8454
LR Statistics	39.0131
Prob(LR Statistics)	0.00001

The output given above will give regression equation as follows:

V_{ij}=0.926-0.000404TC+0.00002Y -0.016 A+ε..... (10)

Calculation of Consumers Surplus

According to Tikapur Municipality record, the total annual park visit in the Fiscal Year 2013/14 is 141918.As described above in the methodology section the individual average consumer surplus could, according to Garrod and Willis (1999), be calculated as in equation (3) given in Chapter two earlier.

Consumer surplus = -1/ Coefficient for TC ..... (11)

Applying the results in this model gave: $\frac{-1}{-0.000404}$ =2475.25 .....(12)

Aggregated consumer surplus = Total Annual park Visit*2475.25 ..... (13)

Aggregated Consumers Surplus = 141918*2475.25 = NPR 351,282,530 .....(14)

The result of equation 13 gives mean consumer surplus which is NPR 2475.25. This can be interpreted as mean consumers' surplus per visitors per trips. The aggregated consumer surplus for the TBP was calculated to be NPR 351,282,530 as seen in equation (14). This value seems high, and a probable cause for the high consumer surplus could be the low travel cost coefficient. Even though this value seems high it is possible that it is underestimated since the chosen method only captures the recreational value, and no other parts of the total economic value. The consumer surplus has a high value and why the value might be so high can, according to Garrod and Willis (1999), be that the consumer surplus is highly sensitive to the specifications in the model. Therefore, we have to take into consideration that these findings may be dynamic, temporal and differ with respect to time and conditions.

Opportunity Cost of the Park Measured in Terms of Local Crop Production

The benefit foregone by the society in terms of next best alternative opportunity for the existence of the Park is called opportunity cost in the context of this study. The opportunity cost of the Park has been estimated based on the productivity of the cultivated land in and around the Park. The study deals with the question such as what would have been produced if the Park land were cultivated for agricultural production and how much in economic measurement.

The researcher needed to take into consideration national as well as local productivity profile in order to calculate agricultural productivity of the study area. According to **Agriculture Development Strategy (ADS) 2014** of Government of Nepal, agriculture land productivity of Nepal is $1804 per hectare per annum. But, Agriculture Service Centre, Tikapur has prepared its own land productivity profile which is most suitable for this study to calculate opportunity cost of the TBP surrounding area. Based on the same, researcher has calculated NPR 152500 per hectare per annum. The total area of TBP Park land is 58.0243 hectare. If the Park land were cultivated, it would yield Rs. 58.0243* NPR 152500 = NPR 8,848,706 equivalent of the agriculture production per annum. The amount can be considered as the benefit foregone by the nation in terms of crop production for the existence of the Park. The estimated opportunity cost of the Park based on the crop production value in adjoining cultivated land, approximately NPR 8.85 million per annum, is the benefit forgone by the nation for the operation and maintenance development of the Park.

Calculation of Benefit Cost Ratio

Benefits from the TBP may be direct and indirect. Direct benefits include benefits from the selling of fruits like mango and leachy that TBP does. Indirect benefits may include recreational benefits, income from tourists, hedonic property of value of park surrounding area and extension of precious greenery resources. However, benefit derived from tourist income, hedonic property of value of park surrounding area and extension of precious greenery resources are beyond the scope of this study and will not be included in this research. Costs include factors like entry fee, labor costs, and salary of the Park personnel, daily wages, management cost and opportunity cost. The precise explanation of BCR is given in table 5.

Table 5 Calculation of Benefit Cost Ratio (BCR)

Benefit Cost Category	Particulars	Amount (in NPR)
Benefits	Estimated Recreational Benefits*	351,282,530
	Revenue from Entry Fee***	3,547,950
	Revenue from sales of fruits ***	143,000
	Revenue from vehicle Parking ***	245,250
	Total Benefit (A)	355,218,730
Costs	Salary and allowance of park staff***	2,435,700
	Repair and Maintenance cost of park***	1,664,300
	Opportunity cost of Park land**	8,848,706
	Total Cost (B)	12,948,706
	Benefit Cost Ratio (BCR) = A/B	27.43

Note: * Calculated by Researcher based on Poisson estimation.
** Calculated by Researcher based on ADS data.
*** Data from Tikapur Municipality.

BCR = Total Benefit /Total Cost=355218446/12948706 = 27.43 ..... (15)

The above result of BCR given in equation (20) can be inferred as per NPR 1 cost stream has generated benefit stream of NPR. 27.43. Thus BCR is clearly seen as extremely beneficial.

Conclusion

Tikapur Banglaw Park (TBP) as a public recreational park provides different arrays of utilities to the people of surrounding area and nation as whole. There is increasing and widespread public support for public park provision in urban areas given that they provide an array of different recreational activities enhancing the citizen's quality of life and so does the TBP. TBP is environmental goods and service which is not traded in the usual markets and the benefits derived from this commodity are external to the market. It has not only contributed to improve surrounding environment by increasing greenery, reducing air, water, and noise pollution, and helping in biodiversity preservation but also generated varieties of economic benefits. The observed data of this study reveals the fact that vast majority of people of far west and mid west regions of Nepal are benefitted by TBP. Based on the survey data of this study, TBP public parks generate high level of recreational benefits and social welfare to the society every year. In other words, estimated recreational benefit is of great significance. In nutshell, TBP is the non-market environmental and ecological resources and

the integral components for deriving recreational utility for vast majority of people and has contributed significantly to net value addition of the surrounding areas and economy as a whole. Therefore, it can be concluded that, TBP management authority should pay serious attention to upgrade the quality of the park service.

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