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Valuation of National Parks: An individual travel cost approach

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Abstract
Currently the most crucial policy poser in India is sustainability and conservation of environmental resources, for their economic valuation is an effective operational tool for designing policies in relation to their sustainable use. National parks perform two-fold functions: in situ preservation of wildlife and recreational use. From the last century a comprehensible concern has outpoured regarding the management of national parks including biodiversity enhancement and on site facilities. However, expedient economic benefits of outdoor recreation are generally gauged by non-market techniques of demand-based Individual Travel Cost Method (ITCM) and Contingent Valuation Method (CVM). Travel Cost Method, rooted in the assumption of 'weak complimentarity' between consumption expenditure and environmental asset, through consumption behaviour determines a value of non-market environmental resource. The TCM has been strictly adhered to estimate the recreation use values of the Dachigam National Park as well as value estimates crucial to the development of the park acquisition and management policy. Results show that consumer surplus per visitor per visit in present study is equal to Rs. Rs. 30,303 (US$481) which translates into an annual aggregate value of Rs. 28, 65, 79,780 (US$45, 48,885).

Keywords: National Park, Sustainability, Recreational Value, Travel Cost Method, Dachigam National Park.

1. Introduction

National parks play an integral role in the conservation and preservation of biodiversity and the provision of other benefits associated with the maintenance of ecological integrity (Chape et al., 2008; Stolten & Dudley, 2010). International Union for Conservation of Nature Resources (IUCN) defines national park as "a place where the ecosystem is not materially altered by human exploitation an d occupation, where the park is protected by the highest competent authority of the country and where visitors are allowed for inspirational, educative, cultural and recreational purposes" (Dobson, 1996). Further, the preservation of biological diversity and ecological integrity is considered as the primary objective of national parks and protected areas in present day world (Stolten & Dudley, 2010). As an economic good, national parks are subjected to a number of market failures because of the fact that they exhibit varying degrees of non-rivalry and non-excludability, generating positive externalities in the form of ecosystem services. Recreation and tourism are one of the many benefits associated with national parks and protected areas. With the exception of areas managed for strict wilderness and nature protection, most protected areas allow for recreational and tourism activities. Some of these activities will yield indirect returns in the form of increased regional economic activity.

One framework commonly utilized in non-market valuation studies is the concept of total economic value (TEV). This framework presents a means of identifying the values associated with protected areas with the end goal of expressing them in monetary units. The TEV of a National Park consists of use and non-use values. Use values comprises of direct use value, indirect use value/ecological functions value and option value. Nonuse value comprises of existence values and bequest values.

National Parks can provide a range of direct use values in terms of recreation, tourism, scientific research and education. Other values stem from harvesting and extractive activities such as agriculture, grazing, collection of fuel wood and hunting (WCPA-IUCN, 1998) Ecological function value refers to the benefits provided by protected areas in the form of ecosystem services such as carbon sequestration, erosion and flood control, nutrient recycling and water purification. Option value refers to the benefit associated with maintaining a protected area for use in some future period. With regard to non-use values, existence value is the benefit from the ongoing presence of the protected area independent of any actual use. Bequest value is the satisfaction received from knowing that future generations will benefit from the protected area. The motivation for non-use values originates from widely held notions of intergenerational equity, altruistic utility functions and acknowledgement of the intrinsic value of the environment (Bateman *et al*., 2002).

Whereas quantification of direct use values is relatively easy in monetary terms, the benefits associated with other sources of value are not subject to market transactions. Accordingly, only non-market valuation techniques are able to provide an indication of the value of these benefits

2. Profile of the Study Area

Dachigam National Park is one of the most important protected areas in Jammu and Kashmir because it holds the last viable population of Hangul in world. It also provides a natural habitat for a number of threatened and endangered species. It is a single compact catchment area which has a unique and diverse type of fauna and flora. The park occupies

almost half of the catchment zone of the famous Dal Lake and nurtures rich assets of threatened species. The faunal, floral, ecological and geomorphologic significance together with proximity to Srinagar has added splendor shine to the glory of Dachigam, as a gene pool for rebosement, protection and propagation of wildlife. Furthermore, Dachigam is stupendous example which represents and preserves significant ecological and biological processes in the way of evolution and development of various ecosystems consisting of several communities of plants animal species.

Dachigam National Park lies between 34° 05'N – 34° 11'N and 74° 54'E -75° 09' and the area comes under the civil jurisdictions of Srinagar. The park covers an area of 141Sq. Km. and is divided into two Lower and Upper Dachigam. The park was notified under section-35 of Jammu & Kashmir WPA, 1978. Today it is managed in IUCN category-II (National Park). The entire area of Dachigam is mountainous and has crystalline rocks. The climate of the park is sub-Mediterranean type having two spells of dryness of April-June and September-November (Singh and Kachroo, 1977, 1978). Further, Dachigam National Park is gifted with numerous perennial streams, nallah, springs, glaciers and the main Dachigam nallah coming from Marshar lake as a result of which water supply in the area is adequate throughout the year. The perennial water streams and main nallah provide drinking water for the wild animals living in the natural habitats of Dachigam National Park.

Dachigam being very close to Srinagar, summer capital of Jammu & Kashmir, receives a large number of tourists in summer because of the natural beauty. Every year 10, 000-20,000 tourists visit the park which includes students, naturalists, scientists, conservation activists, etc. Therefore, Dachigam NP yields a range of onsite and offsite benefits. Given that the park is managed for high levels of visitor use, the recreational and tourism value of Dachigam is likely to be significant. Other economic benefits are likely to include ecosystem services such as water purification, soil conservation and landscape stability (Management Plan, 2011-2016). Despite the extensive range of economic benefits provided by Dachigam National Park, most of these benefits have never been defined in monetary terms.

3. Research Methods

3.1. Methodology

In order to assign quantitative values to marketable and non-marketable goods and services of environmental resources different economic valuation methods viz. Contingent valuation method, Travel cost method, Hedonic price method, Choice experiment has been used (Ankomah and Adu, 2015; Degroote et al, 2006; Himayatullah, 2003; Bharali and Mazumder, 2012; Hadker et al., 1997; Lee and Han, 2002; Birol et al, 2005; Chopra, 1998). However, we employed Travel Cost Method (TCM) to achieve present study's objective.

Application of travel cost model involves a number of assumptions about factors such as the specification of dependent variable, the measurement of travel costs, specification and measurement of other independent variables, specification of the functional form, and appropriate integration procedure to calculate the estimates of consumer surplus (CS) (Haab and McConnell, 2002).

Theory of TCM and its application is relatively straightforward. It is based on microeconomic theory of consumer behavior i.e. maximization of consumers utility derived from consumption of marketable goods and services subject to budget constraint (see Gavelle and Rees 2004). This analogy can also be applied to environmental goods and services such as wetlands, parks, hill stations, tourist places etc. TCM, as an appropriate and widely used method for estimating recreational demand of natural resources, was first suggested by Harold Hotelling in 1947 (Haab and McConnell 2002).

In order to model travel cost function, it is assumed that individual's utility under TCM depends on number of visits to site, quality of site and bundle of other goods (McConnell 1992; Freeman, 1993).

The individual solves the following utility maximizing problem:

$$Max U\ (X, r, q) \quad \text{(1)}$$

Subject to twin monetary and time constraints

$$M + P_w t_w = X + cr \quad \text{(2)}$$

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

Where,

U= Utility function of the consumers; X = The quantity of the numeraire whose price is 1,

r = Number of visits to the site; q = An index of the site; M = Exogenous income; P_w = Wage rate; t_w =Hours of work; c = Monetary cost of trip; t* = Total discretionary time; t_1 = Round-trip travel time, and; t_2 = Time spent at the site

Substituting P_w from equation (3) in to equation (2)

We get the combined constraint

$$M + p_w . t^* = X + c.r + p_w\ (t_w\ (t_1 + t_2)\ r) \quad \text{(4)}$$

After maximization, the following expression has been obtained which helps in determining the individual demand function for a visit

$$r = r\ (p_w, M, q, X) \quad \text{(5)}$$

Economic valuation of park requires estimation of demand for recreation (equation 10 i.e. number of visits to site and hence calculation of consumer surplus (CS) (the area under the demand curve). Therefore, onsite survey had to be conducted in order to find out number of visits by visitors or tourists actually made to the site during a given period of time, travel costs, and individual characteristics to be used in estimation of TCM.

3.2. Survey Design, Sampling and Data Collection

Target population of the present study for estimating Individual Travel Cost was defined as onsite visitors[1].

[1]The alternative sampling strategy is off-site sampling, in which people are contacted from the whole population usually by mail or phone. No-doubt, this sampling strategy includes the both participants (who take visits) and non-participants (who do not take visits). It also avoids selection biases, and makes simpler to design for random response. But this type of sampling can

Generally, frequent visitors to Dachigam National Park are from nearby areas and neighboring districts, but a huge number of visitors also come from different states and nations of the world. So the ideal target population for conducting onsite field survey of the park was all those recreationists who visited this site in a given time period.

A face-to-face interview method as well as structured pre-tested questionnaire was used to collect information from a random of 200 visitors. For collecting data highly trained and experienced enumerators were employed. The data to undertook this study was collected during months of May, June and July (2015) on weekdays only. Before starting data collection main purpose of the study was first explained to each and every respondent. Respondents were ensured confidentiality and use elicited information for research purposes in order to get unbiased information.

3.3. Econometric Methods

Economic theory does not suggest any particular functional form for TCM's. The most commonly used methods that are statistically befitting include:

1. Linear $r = \alpha + \beta P$
2. Log-linear $\log r = \alpha + log\beta P$
3. Double-log $\log r = \alpha + log\beta P$
4. Negative exponential $r = \alpha \mid log\beta P$

Among other, linear functional form was chosen for estimating results as proved a best fit for the survey data. The basic model used in this study represents the number of visits (r) to park as a function of factors such as the travel cost (RTTC), distance from home to the site visited (RHDS), income (MI), education (Edu), Age, Gender (Gen), Family size (Flyz) etc. Thus, the model was specified as follows:

$$ri = \beta 0 + \beta 1RTTC + \beta 2RHDS + \beta 3MI + \beta 4Age + \beta 5Gen + \beta 6Flyz + \beta 7Edu + \varepsilon i \ldots\ldots\ldots\ldots\ldots (7)$$

Where ri, is the dependent variable and stands for the number of visits by the ith individual to the park per period of time.

RTTC= Round travel cost of the visitor;
RHDS= Round travel distance;
MI= Monthly income of the visitor;
Edu= Education level of the visitor;
Age= age of the visitor;
Flyz= No. of family members of the visitor
Gen= Dummy variable for D = 0, if female and D=1, if male;

4. Results and Discussion

4.1. Descriptive Statistics

Descriptive statistics of key variables (dependent and independent) collected from the onsite visitors of Dachigam National Park are shown in table 1.1.

Number of visits or trips to the site (Dachigam National Park) by visitors in last year was a dependent variable. The majority of visitors originated from other states of the country excluding the state where the site is located. Almost all the visitors in the sample visited the site with the sole intention of enjoying the recreational benefits (like sightseeing, watching endemic and endangered species, spending time in a beautiful place, trekking etc.) it had to offer. Thus it is obvious that the park (Dachigam National Park) had a great significance as recreational site. It attracts many tourists from different parts of the nation as well as from world, as it has the unique recreational facilities like presence of endemic and endangered species, fishing, trekking etc. The average number of trips undertaken to the park (including the present one) was 2.05 as shown in table-1.1.

Table 1.1: Descriptive Statistics of Socio-economic Characteristics of the respondents

Variable	N	Mean	Std. Dev.	Min	Max
RTTC	200	9.376	7.6254	0.16967	31.627
RHDS	200	2237.45	1880.85	2	8000
AGE	200	36.755	11.4609	18	70
GEN	200	0.805	0.39719	0	1
FMSIZE	200	4.775	2.31759	2	15
EDU	200	15.245	3.10858	0	22
VISITS	200	2.05	1.33281	1	8
EDU	200	4.695	1.48086	0	7
INCOME	200	32.868	22.2053	3	150

Source: Field Survey, (2015)

Table-1.2 reports the results of the travel cost regression models for Dachigam National Park. All variables have expected signs. Travel cost incurred by individuals is inversely related to park visitation rates which imply higher the travel cost paid by visitors to reach the park, less frequently they visit.

The regression model results show that the estimated coefficient of the travel cost (RTTC) variable not only had expected negative sign but also found to be significant at 1% level (see Table 1.2). The negative sign of this variable's coefficient suggests a downward slope of demand curve-visitor take less visits as travel cost increases. In the present study, travel cost as a proxy for the price of access which includes the expenses on travel, time cost (travel and onsite time cost), and other expenses on food and accommodation etc. The coefficient of the RTTC was -0.033. It implies that, with a thousand rupees increase in travel costs the expected number of visits (NV) to the site decreased by 0.033% (in terms of semi-elasticity) while holding the all other variables constant in the model (Ali, 2011; Himayatullah, 2003).

The RDHS variable, residence from home to the site, measured in Km (Kilometres) showed a negative sign with significance at 1% level. This indicates that farther the place of residence from the site, lower will be number of visits made by visitor to the site. Coefficient of RDHS was -0.0003. This implies that with a one km increase in distance the number of visits increased by 0.03%, ceteris paribus (Ankomah and Adu, 2015; Himayatullah, 2003).

The results followed many studies such as Englin and Shonkwiler (1995) also showed a negative relationship between quantities of trips demanded and travel distance with a coefficient of -0.144. Pak and Turker (2006) used multiple regression model and also had negative distance coefficient (-1.41E-02) with a t-value of -2.215.

The value of income co-efficient worked out to be 0.01217at significant of 1% level. Its sign accords with a priori expectation. It implies that visitor's income (MI) had a positive and significant influence on recreational demand for

be costly to assemble, as the participation rates from the general population for given site tend to be very low.

visits to the site. A one thousand increase in income of the visitor, ceteris paribus, increases the number of visits to the site by 1.2%. The findings of this variable were in line with (Ankomah and Adu, 2015; Himayatullah, 2003) also found positive relationship between income and number of visits for diving purpose.

Table 1.2: Results from Linear Regression Model

Variable	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
Age	-0.0644	0.0487	-1.32	0.188	-0.1604	0.03171
Gen	0.63267	0.16354	3.87	0.000*	0.31008	0.95525
Flyz	-0.0004	0.03256	-0.01	0.991	-0.0646	0.06385
MI	0.01217	0.00444	2.74	0.007*	0.00341	0.02092
RHDS	-0.0003	4.2E-05	-6.25	0.000*	-0.0003	-0.0002
RTTC	-0.033	0.01214	-2.72	0.007*	-0.0569	-0.009
Edu	0.20039	0.07586	2.64	0.009*	0.05077	0.35001
Cons	2.24494	0.95864	2.34	0.020	0.35406	4.13582
N	200					
F(8, 191)	14.80					
Prob> F	0.0000					
R-squared	0.3634					

Source: Field survey conducted by Author
* Significant at 1percent level or less

The sign of the estimated coefficient of the education variable (Edu) was found positive (0.20039) and complying with a priori expectations. It implies that people who were well educated undertaking more visits to the site, as they have more knowledge about environmental resources and their recreational values than uneducated. We found the variable (Edu) significantly influences (at 1% level) the demand for recreational visits to the site with a coefficient of 0.20039. Keeping the other variables constant in the model, a one year increase in schooling will increases number of visits by 20 %.Hellerstein (1991) and Ali (2007) arrived at same conclusion.

Sex is also found significant at 5% level with positive sign of its coefficient. It implies that male tourists are more enthusiastic to enjoy recreational sites than female. (See Himayatullah, 2011)

4.2. Welfare Estimates for Dachigam National Park

Multiple regression model was used to estimate the recreational demand function for the number of visits to the site. After estimating the demand function the results were used to estimate welfare measures/consumer surplus (CS) of visitor's visits to the Dachigam National Park. Only the visitor's to Dachigam National Park were used for the calculation of welfare measures in the present study. Non-visitors welfare could not be calculated as their demand function was not estimated with these models (see Englin and Shonkwiler 1995; Martinez-Espineira and Amoako-Tuffour 2008). The estimated coefficients of the travel cost were used to calculate the consumer/welfare surpluses.

The consumer surplus per visitor per visit can be calculated by $1/-\beta_{RTTC}$ (Creel and Loomis, 1990), which in present study is equal to Rs. 30,303 (US$481) by using estimated coefficient of RTTC (β_{RTTC}) of Multiple Regression Model. Since the average recreationists/visitors visit per year in our study was 2.05 (see Table 1.1). Thus the average annual consumer surplus per visitor is calculated by multiplying the average annual visits by consumer surplus per visitor per visit, which is equal to Rs. 62,121 (US$986). Similarly, the annual recreational value of the Dachigam National Park for our sampled visitors (301) was calculated by multiplying average annual consumer surplus per year per visitor by the total number of sampled visitors (i.e. 301), which is equal to Rs. 1,24,24,200 (US$1,97,209). This implies the Dachigam National Park visitors received a substantial amount of monetary benefit from the recreational use of Dachigam National Park ecosystem. It indicates that the Park has a great unseen economic value and it is a valuable asset for the society.

The total social welfare value of the recreational activities of the Dachigam National Park is estimated by multiplying the total annual population of visitors to the park by average annual consumer surplus per visitor. This is however sometimes difficult to find the total welfare value since the total number of visitors most of the time goes unchecked. The only available estimate of the annual population of visitors/tourists to the park in (2014)[2] was 1550, which includes domestic as well as foreign tourists. On the basis of this estimation of total tourists/visitors flow to Dachigam National Park, the total consumers surplus of Dachigam National Park are equal to [Rs. 62121 x 8807] Rs. 54,70,99,647 (US$86,84,121) [3].

Total recreational value equals consumer surplus plus total cost of the visit. The total annual monetary recreational value of the Dachigam National Park for given number of visitors (8807)[4] is estimated at Rs.28, 65, 79,780 (US$45, 48,885). This estimated value of the park is sum of the consumer surplus (benefit) of visitors and the total expenditure of visitors to the site in the form of transportation charges, hotels and other accommodation charges, expenditure on food, and other expenses on site like expenses on site seeing, watching endemic and endangered species and trekking etc.

Thus total expenditure of recreational visitors either during travelling or on the site and consumer surplus provides market signals to the people who were engaged in some form of economic activity such as providing services (like, tourist guide, accommodations etc.) to serve visitors. This would help them to improve the standard of living by providing

[2] Department of Wildlife, Jammu and Kashmir, Srinagar (2014)
[3] 1US $ = Rupees 63 on the basis of exchange rates on June,2015
[4] Data from Department of Wildlife Protection J &K (2015)

some form of livelihood and give them opportunity to generate income and employment.

5. Conclusion

National parks being a part of ecosystem provide number of services and goods which are beneficial to living organisms. Our study is an effort to highlight some use values of Dachigam national park (J&K). Travel cost model has been used to measure ecotourism value of DNP in Jammu and Kashmir (India). The findings from the study indicated that the direct use values (like recreational values) of Dachigam National Park are quite high. Using estimates from the park, it is shown that annual recreational value for DNP worked out as Rs.28, 65, 79,780 (US$ 45, 48,885) for given number of visitors (8807) from the site. The recreational value estimated in this study underscore the importance of conservation of nature. Results of the study will become a crucial instrument for pragmatic policies of ecotourism development of natural resources in the valley.

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