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Willingness to Pay for Preserving National Park Biodiversity: A Case Study

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Abstract

This paper employs a stated preference environmental valuation method i.e. Contingent Valuation Method to estimate the willingness to pay for the conservation of the Dachigam National Park as well as value estimates crucial to the development of the park acquisition and management policy. A contingent valuation study is conducted with 301 visitors and the data are analysed using the binary logit model. Results show that the majority of the tourists (benefitted from the use values of the park) were willing to pay (WTP) for its improvement. Respondents' willingness to pay for the conservation of the park ranges from Rs. 110 to Rs. 140 per year with a mean of around Rs. 125 per year. With the use of the benefits transfer method, this case study is expected to provide policy-makers, corporate players, stakeholders with useful information for the conservation of biodiversity in the Indian sub-continent, as well as in other countries.

Keywords: Contingent valuation method, Dachigam national park, Conservation, Willingness to pay.

Contents

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1. Introduction

International Union for Conservation of Nature and Natural Resources (IUCN) defines national park as " a place where the ecosystem is not materially altered by human exploitation and 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). National parks play a decisive role in conservation and preservation of biodiversity and provision of other benefits associated with the maintenance of ecological integrity (Stolton and Dudley, 2010). National parks like other environmental resources and public goods have several benefits for humans in a multiplicity of ways. In addition to their ecological functions, national parks can be used as ecotourism sites for recreational gains which will positively contribute to national income, simultaneously society around the area of national park can obtain economic advantages. National parks system is a national museum. Its purpose is to preserve forever certain areas of extra ordinary scenic magnificence in a condition of primitive nature. Its recreational value is also very great, but recreation is not distinctive of the system. The function which alone distinguishes the national parks is the museum function made possible only by complete conservation (Runte, 1997). In the beginning, national parks were living embodiment of aesthetic values. Passionate admirers of nature recognized national parks as storehouses of thrill and wonder which can fulfil the visitors' recreational needs. In the developed countries the protected areas, particularly national parks, which have utility, were objects having a market. In the countries of Latin America, Africa, India, quite a reverse to the developed, the establishment of national parks was essentially for the preservation of biological diversity both qualitatively and quantitatively. Hence, respectively monumentalism and environmentalism were the driving impetus behind the setting up of national parks in these countries.

Presently national parks and reserved areas are at the forefront of the global conservation programmes and policies with the integral objective of continuation of ecological integrity by placing the constraints on the degree of human interaction and exploitation. National parks preserve areas of natural beauty and cultural heritage, maintain genetic diversity and ecological processes, contributing toward sustainable livelihood strategies and additionally make possible recreational, educational and scientific opportunities (McNeely, 1994; Stolton and 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. 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.

The understanding of the economics of the national parks has always been hindered by a lack of tangible economic values for these environmental assets. National parks exhibit public good characteristics and generate significant externalities. The resulting market failure ensures the benefits associated with the national parks are not subject to formal market exchange mechanisms making their valuation extremely hard. Despite this, national parks provide a range of economic benefits in terms of ecosystem services and various other use and non values. The quantification of these values in monetary terms is therefore necessary to ensure that policy and management decisions maximize societal welfare through allocative efficiency. This has traditionally been achieved through the use of non market valuation techniques such as the contingent techniques and travel cost valuation methods.

2. Case Study

Dachigam National Park is situated 18 km north-east of Srinagar. It is divided into lower and upper Dachigam areas. Harwan Reservoir and New Theed Village form its base, while Mahadev Peak is the topmost among surrounding mountain range. It is one of the most important protected areas in Jammu and Kashmir. Since Dachigam National Park has last viable population of Hangul (*Cervus elaphus hanglu*) in world as well as the largest population of Asiatic black bear, it has become a famous tourist destination. The National Park besides gives shelter to a variety of floral and faunal elements, viz., Himalayan Brown Bear, Himalayan Black Bear, Musk Deer, Leopard, Hyena, birds (150 species), vascular plants (661 species) etc.

Dachigam being very close to Srinagar, summer capital of Jammu & Kashmir, receives a large number of tourists in summer because of natural beauty. Every year 10,000-15,000 tourists visit the park which includes students, naturalists, scientists, conservation activists, etc. Therefore, DNP yields a range of onsite and offsite benefits. Given that park is managed for high levels of visitor use, 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 extensive range of economic benefits provided by Dachigam National Park, most of these benefits have never been defined in monetary terms.

3. Methodology

3.1. Contingent Valuation Method (CVM)

3.1.1. Contingent Valuation Method (CVM): Theoretical Background

CVM has been used as a standard and flexible tool for valuing non-marketed environmental resources (Hanemann, 1994). It is a stated preference technique used to quantify economic value of non-marketed goods and services, by measuring individuals' consumer surplus (Mitchell and Carson, 1989). It attempts to allocate values for public goods by people's maximum amount of Willingness to Pay (WTP) to obtain non-market goods and service or minimum amount Willing to Accept (WTA) to compensate for loss of environmental resources. Both these approaches are very useful to measure the welfare change. However, WTP is preferred to WTA because the latter is

considered not to be consistent with convergent validity as it does not adequately measure economic surplus (Venkatachalam, 2004).

CVM is a survey based technique, where a hypothetical market situation is created to elicit people's preference by using different payment vehicles[1]. Often used payment vehicles like voluntary payment, taxes, utility bills, entrance fee etc are likely to be familiar to most respondents (Mitchell and Carson, 1989). Despite its appeal CVM has also been widely faulted (see Hausman (2012))[2]. In response to these objections, improvements and refinements have been proposed and tested. These in turn have further enhanced the credibility of its technique (Carson, 2012; Haab *et al.*, 2013)[3]. Be that as it may, method despite its limitations is one of the effective methods to place value to public goods especially in case of passive use values. Hence, we preferred CVM to estimate benefits of improved Dachigam National Park and analyse factors that determine the stated WTP for improvement.

3.2. Econometric Method

Logit Model or Probit Model is generally used for analyzing data collected by using CVM (Loomis, 1987; Fix and Loomis, 1998). In the present study, data collected via CVM had one dependent variable with qualitative and binary choice (Yes or No type of answers) nature. A 'Binary Logistic Regression Model' has been employed for analysis of respondents WTP for improvement or maintenance of park's goods and services. Probability (P_i) reveals that one accepts to pay a maximum amount (in Rupees) for improving and maintenance of Dachigam National Park. A linear expression of the model is as follows:

$$WTP\ (yes = 1)\ f(TMI\ +\ Age\ +\ Education + ErM)\ \ldots\ldots\ldots (1)$$

Above model variables are explained in Chapter-V. It was specified by using the following Hanemann (1984) formulation:

$$P_i\ =\ F\eta\ (\Delta V) = \frac{1}{\{1\ +\ exp\ (-\Delta V)\}}$$

$$= \frac{1}{\{1\ +\ exp\left(-(\alpha\ +\ \beta_1 S\ + \beta_2 ErW + \beta_3 WSW + e)\right)\}} \text{\_\_\_\_\_} (2)$$

Where Pi represents the probability of answer 'yes', $Fn\ (\Delta V)$ is cumulative distribution function (cdf) which explains behavior of dichotomous dependent variable with a standard logistic distribution and includes some of the socio-economic factors, S is a vector of socio-economic characteristics, (includes respondents monthly income, age, education and earning members of his family), α is intercept, β_1, β_2, and β_3 are estimated coefficients. It is expected that signs of β_1 may be positive or negativedepending upon socio-economic variable (S). Variables income, education and earning members of family is expected to be positive. For age the sign of coefficient can be either positive or negative. Parameters of Logit Model were estimated, by 'Maximum Likelihood Estimation Method' (Lehtonen *et al.*, 2003) using STATA 12.0.

4. Results and Discussion

4.1. Descriptive Statistics of Variables

Out of the total respondents/questionnaires 336 envisaged, only 285 were used for Contingent Valuation analysis. 20 questionnaires were rejected on the on the basis of providing incomplete or partial information whereas 31 questionnaires showed incentive compatibility or hypothetical market rejection. The descriptive statistics of variables used in demand function of Contingent Valuation analysis is based on 285 respondents (shown in Table-4.1.1) are discussed below:

Table-4.1.1. Descriptive Statistics (N=285)

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	285	35.7193	10.5889	18	70
Edu	285	4.96842	1.44222	0	7
ErM	285	2.36491	1.34799	1	9
MI	285	33415.8	20869.1	3000	150000

Source: Field Survey Data (2015)

WTP as the dependent variable was regressed on set of independent variables i.e. Monthly Income of Respondent (TMI), Age of the Respondent (Age), Education of Respondent (Education) and Total Earning Members in Family (ErM) in the present study.

WTP: About 84.82 % of the respondents were WTP for the improvement of park services and only 15.18 % of the respondents having zero WTP.

[1] Payment vehicle in a CV study plays a very crucial role in determining the WTP/ WTAC for any change in environmental resources. Studies across the developed world prefers 'additional income tax' as a payment vehicle than other frequently used tools like 'donation to a charitable organization', 'compulsory or voluntary fees', etc (see for example, Bateman, Richard, Brett, Michael, Nick, Tannis, Michael, Graham, Susana, Ece, David, Robert and John (2002). Kwak, Seung-Hoon and Chung-Ki (2007). But in Developing and lower income countries, where income tax is not a very relevant option generally prefer other options like 'donation', etc. This study has adopted 'donation to a charitable organization' run jointly by a reputed non-profit NGO along with local people as a means of payment vehicle. Rationale for choosing 'donation' over 'income tax' in this study can be justified on the ground of unfamiliarity and irrelevance of income tax as most of households in this areas generally do not pay income tax to government due to lower income. In such circumstance putting an 'additional income tax' is meaningless.

[2] Hausman (2012). After reviewing the Contingent Valuation Method (CVM) literature for twenty years concludes that CVM would still face problems such as: hypothetical bias/overstatement, disagreement between Willingness to Pay and Willingness to Accept, problems of scope and embedding. He said that CVM has many flaws in practicing and have zero weight in public decision-making.

[3] A counter argument had been put-forth by Haab, Interis, Petrolia and Whitehead (2013). They opined that Hausman was entirely made debunk CVM once and for all. They completely agreed with the Carson (2012). Who concludes "the time has come to move beyond endless debates that seek to discredit Contingent Valuation and to focus instead on making it better".

TMI: Total Monthly Income (TMI) is a continuous variable representing the household's monthly income from all sources in Rupees. The monthly income of the respondents varies from Rs. 3000 to Rs. 150,000 with mean TMI of Rs. 32951.8.

AGE: Ageis a continuous variable representing the age of adult respondents in years (above 18 years). It ranges from 18 to 70 years with a mean value of 35.7193 years.

***EDUCATION*:** Education is a categorical variable taking values from 1 to 7. The major portion of the sampled population having highest attained education level (postgraduates and above) were found to be 42.11%. About 26.73% visitors were graduates Only 1.05% visitors had up to primary (i.e. Class I-V) level of education, 3.86% had up to middle school (i.e. Class VI-VIII) level of education, 7.72% sampled visitors had up to high school (i.e. Class IX-X) and 17.19% sampled visitors had up to secondary school (i.e. class XI-XII) level of education. Around 1.4 % visitors were found to be illiterates

ErM: Earning members of the family (ErM) was continuous variable ranges from 1 to 9 members. The average number of earning members was 2.36 members.

4.1.2. Results from Econometric Model for CVM

Estimated results of CVM were obtained by using Multiple Regression Model in econometric software STATA 12.0 for estimating the parameters of variables. The results are shown in Table- 4.1.2.1. The results document the expected affect of variables on WTP. Three out of five variables were found significantly associated with the Willingness to Pay.

The expected relationship between the significant variables with the WTP was in line with the economic theory. The coefficient of household monthly income (TMI) was found positive as expected showing that an increase in the monthly income would increase WTP for park improvement. A one percent increase in income would increase willingness to pay by an average of 0.00011 percent.

Table-4.1.2.1. Logit Model Estimates

Dependent Variable: P(Yes) for WTP

Variables	**Coefficient**	**Std. Err.**	**P>|z|**
TMI	0.00011	0.000020	**0.023***
Age	0.01135	0.3243	0.557
Education	0.67893	0.2673	**0.007****
ErM	2.09327	0.25843	**0.010****
Constant	- 0.3175	1.7728	0.858
Log Pseudolikelihood	-76.566		
Wald chi2(7)	25.07		
Prob> chi2	0.0003		
Pseudo R^2	0.3703		
Number of obs	285		

Source: Field Survey Data (2015)

* and** shows significance at 5% and 1% respectively

4.1.3. WTP and its Influencing Factors

The positive sign of education means that an increase in number of years of education would increase their WTP. More specifically, a one percent increase in years in education would increase willingness to pay for the improvement of the national park by 0.67893 percent. The results of this variable was in line with the Jaffrey *et al.* (2012) and Bhatt *et al.* (2014) in which it was found that educated people would pay more for the conservation of environmental sites.

Income and education are among the most popular variables to describe the socio-economic characteristics of a sample. In this study income and education were found to be significant variables in influencing the WTP.

In the present study, Age was found positive but was not significant and did not explain WTP. The positive sign of the variable (age) implied that the older the person the more he/ she was willing to pay for improving the quality of the park.

Earning members of the family (ErM) having positive sign as was expected, which implied that more the earning members in family more the benefits from the park greater will be their willingness to pay for improvement.

4.1.4. Willingness to Pay for Dachigam National Park Improvement Scheme and Welfare Estimates

Dachigam National Park has potential use and non-use values. However, the economic exploitation by the locals and the stress of tourist appeared beyond the park's carrying capacity. Thus, it is therefore imperative requirement to use the park in a sustainable manner. In the present study, CVM was used to estimate the conservation and management value of park by using open-ended questionnaire format for elicitation of responses of WTP (yes/no) and other related questions. The analysis done on the basis of responses from two main questions asked during CV survey i.e. *"Are you willing to pay for conservation of Dachigam National Park?" and "How much you are willing to pay for if entry fee is increased from its current levels?"* Results showed that the majority (84.82%) of the tourists (benefitted from the use values of the park) were WTP for its improvement. Respondents' willingness to pay for the conservation of the park ranges from Rs. 110 to Rs. 140 per year with a mean of around Rs. 125 per year.

Generally, WTP estimates may be affected by level of effectiveness, reliability and trust of managing institutions (Bateman *et al.*, 2002)

The aggregate Tourist's WTP for improvement of Dachigam National Park was computed as Rs. 35,625, which was calculated by multiplying the mean WTP by the total number of sampled tourists (excluding the protesting

respondents). After excluding the protest zero's[4] (1913)[5], the total number of visitors with expected valid responses in the study area was 10841 in 2015. Therefore, the total aggregate value of the park improvement for all the tourists was (125 x 10841) Rs. 13, 55,125. Even though in monetary terms the value was not quite high, but given the acceptance rate of the hypothetical preventive treatment, nearly 85% suggests that interventions are highly desired and demanded in this case area.

Total WTP of Tourists for enhancing recreational facilities worked out to be Rs. 13 lakhwhich is 27 %of the annual budget outlay for the conservation of National Parks in the State. On the basis of visitor's willingness to pay (WTP) for benefits and preference for quality improvement decision makers should design recreational projects and other enhancement programmes which don't cause any negative effect to natural environment. It includes viz. creating separate tourist zone, eco-friendly restaurants and more attractions for migratory and local birds. The park authority should increases the current levels of entry fee which will generate additional funds to the park authority. This enables the concerned authority to have a higher income to support improvement and expansion in quality of the recreational services.

4.1.5. Not Willing to Pay for Improvement

After excluding the protest zeros, about 51(15.18%) respondents among the sample (336)[6] were providing zero willing to pay for proposed improvement or conservation programme. Almost in all the CV studies a proportion of respondents gave various reasons for not paying any amount for such programmes of environmental goods and services.

In the present study, visitors gave multiple reasons for rejecting to pay for proposed project. According to them there is no need to pay as the park is being funded by national and international organizations. They also said that the national park is a public good and it is government's duty to maintain and improve the quality of the park's ecosystem as numerous national and international agencies funded for it. A certain percentage of respondents opine that they do not trust such management scheme, as they believed that despite the huge investment on the various Projects/Programmes, the health of the park is still far from satisfactory.

5. Conclusion

CVM was used to estimate the conservation value of Dachigam National Park and worked out to be Rs. 13.55 lakh per year as additional revenue to the park management in the form of increased entry fee from current levels. WTP value of the study, although small, induces policy makers and corporate players through public private partnership (PPP) to make new and more effective policies and projects for the betterment of the park

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[4] Protest zero's in the present study were recognised, by some reasons like the respondents rejecting the market scenario or Income Constraint.

[5] These tourists were expected to protest against the proposed project in the entire study area (Dachigam National Park), which were calculated by the multiplication of the percentage of protest sampled tourists (15%) by the total number of visitors who visited the study site in 2015. Hence, 15% x 12754 = 1913. Thus the welfare of tourists was measured after excluding this number from the total number of tourists in the study area.

[6] After excluding incomplete and protested questionnaires from the original sample (336).

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