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Economic Valuation of the Environment and the Travel Cost Approach: The Case of Ayubia Natioanl Park

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INTRODUCTION

Environmental and natural resource systems such as lakes, rivers, streams, estuaries, forests, and parks provide goods in terms of resources (e.g., flora, fauna, and minerals) and services (e.g., waste sink assimilation), a source of amenity services, use for recreational purposes, and life-support functions. Knowledge of the values of these services may be important for a variety of reasons. Access to such resources for recreation is typically not allocated through markets. Rather, access is typically open to all visitors at a zero price or a nominal entrance fee that bears no relationship to the cost of providing access. And there is no or little variation in these access prices over time or across sites to provide data for econometric estimation of demand functions [Freeman (1993); Nillesen (2002)].

Ever since the second half of the twentieth century, concern about current and future use of our natural resources and environment has emerged at an increasing rate. This growing concern is accompanied by an increasing interest in so-called nature-based ecotourism. Presently, both benefits and threats have been observed resulting from the growing importance of ecotourism in environmentally sensitive areas [Nillesen (2002)]. Ecotourism plays an important role in increasing natural resource conservation and economic growth. It may also lead to management and policy challenges.

Like other environmental resources and public goods, national parks benefit society in many different ways. They perform not only ecological functions but also provide recreational facilities to those who visit these parks. National parks also help enhance precious foreign exchange earnings to national exchequers. There are only few parks in the country. These parks are, however, threatened by various activities

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like forest fire, soil erosion, and human settlement inside the parks, pollution created by the villagers or visitors inside the parks as well as encroachment by local villagers. Thus, the overall negative and undesirable impact caused by one or another reason may be associated with insufficient funding for managing these parks.

Pakistan, like some other developing countries, is seeking to revitalise its nature-based tourism sector to an expanding system of national parks and reserves. The Govt. of Pakistan has, in recent years, felt a serious concern over the deforestation and has shown significant interest in the growth of a renowned national park system. Pakistan has a number of national parks, reserves, and wildlife refuges in different parts of the country. Despite limited number of national parks and reserves their management is far from satisfactory. This may partly be because of insufficient governmental funds and open access of visitors to these places. There is a need for a thorough investigation of how these parks can be well managed and how these environmental resources can be valued. The present study has been conducted to obtain economic information about benefits that flow from recreational use of a national park, *Ayubia National Park* (ANP), Pakistan.

The overall goal of the study is to measure the economic value of the ANP. The specific objectives the study are:

(1) to determine factors that affect the visitors' willingness to pay (WTP) for recreational services of the park;
(2) to estimate the consumer surplus and recreational value (benefits) of the ANP;
(3) to find out whether improvement in recreational benefits of the park would lead to a higher demand for park visitation;
(4) to suggest policy recommendations as to how overall benefits of the park can be improved.

VALUING ECOTOURISM IN DEVELOPING COUNTRIES

There is a growing body of literature that focuses on valuing ecotourism and wilderness areas in developing countries. The primary approaches used in these studies—TCM and CV—were both pioneered in the USA and have only recently been applied in developing countries. There are a number of environmental valuation studies but only several studies have used economic approach to calculate welfare measurement.[1] The Lumpinee Park study by Grandstaff and Dixon [Grandstaff and Dixon (1986)] and TDRI/HIID study on Khao Yai National Park [Kaosa-ard, Patmasiriwat, Panayotou, and Deshazo (1995)] are two main studies conducted in Thailand which have used economic valuation methods. Both studies have combined the travel cost method (TCM) with the open-ended contingent valuation method (CVM) to assess willingness to pay (WTP).

[1]For further details about environmental valuation methods, see Bateman and Willis (1999) and Freeman (1993).

Chase, *et al.* (1998) studied ecotourism demand and differential pricing of Natural Park access in Costa Rica. The study presents a conceptual framework and empirical analysis of the impacts of introducing differential entrance fee policy at three national parks in Costa Rica. Another study [Isangkura (1998)] used the contingent ranking method to measure the value of environmental benefits of three recreational areas in northern Thailand. Arin and Sills (2001) studied developing tourism to national parks in the Republic of Georgia. The study used CVM to determine potential revenue capture by the park, with split sample evaluating the impact of 'annual pass' vs. 'daily entrance fee' payment vehicle on WTP and on expected numbers of and length of visits.

The review of relevant studies shows that even though some studies [Grandstaff and Dixon (1986) and Kaosa-ard, *et al.* (1995)] carefully measured the environmental benefits, but these two studies focused on a single park and did not include park substitutability in their analysis. Only one study [e.g., Isangkura (1998)] was based on multi-park system. But these three studies were undertaken in Thailand. Studies conducted in other developing countries though somewhat better suffered from methodological limitations of one type or another. No such study has ever been conducted in Pakistan. The present study, which studies valuation of Ayubia National Park, may be considered as a pioneering work in park valuation in Pakistan.

DESCRIPTION OF THE STUDY SITE

Ayubia National Park is a small national park in the Murree hills. It is located North of Murree in the Himalayan Range Mountains. Ayubia consisting of four hill stations, namely, Khaira Gali, Changla Gali, Khanspur and Gora Dhaka is spread over an area of 26 kilometers. These hill stations have been developed into a hill resort known as Ayubia. The chairlifts provided at this place are a matter of great attraction. It is an important place from the viewpoint of wildlife, nature, ecotourism, and education. This park provides refuge to the elusive leopard and the black bear. Bird watching is excellent here. There are steep precipices and cliffs on one side and on the other are tall pine trees. The scenery is superb with huge pine forests covering the hills and providing shelter to the larger and smaller mammals. Wild animals are also found in the thick forests around. Mammals in the park include Asiatic leopard, Black bear, Yellow throated marten, Kashmir hill fox, Red Flying squirrel, Himalayan palm civet, Masked civet and Rhesus Macaque. Birds in the park are Golden eagle, Griffin vulture, Honey buzzard, Peregrine falcon, Kestrel, Indian sparrow hawk, Hill pigeon, Spotted dove and Collared dove.

THEORETICAL FRAMEWORK

Following Nillesen (2002) a representative consumer has been considered who consumes a marketable good and an environmental good, namely visits to a national park. The consumer maximises utility subject to a budget constraint. The

budget is constrained by the income the consumer earns, represented by the multiplication of a wage rate and the hours of paid work. The algebraic form is:

$$Max: U(x,v) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$
$$x,v$$
$$\text{subject to: } wL = p_x x + p_o v \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where: U = Utility, x = The market good, v = Visits to the park, w = Hourly wage rate, L = Hours of wage labour, p_x = Price of market good x, p_o = Out-of-pocket expenses for a visit to the park.

However, out-of-pocket expenses are not the only cost of visiting the park. Consumers must take time to travel to the park, time, which alternatively could have been devoted to some other activity. Time has an opportunity cost. The assumption therefore has been made that the consumer faces a utility maximisation problem subject to a time-budget constraint. The consumer is supposed to devote all his time on either working or visiting the national park. The time constraint has the following form:

$$T = L + Hv \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Where: T = Total household time available, H = Time associated with a single round-trip to the park including time spent on-site, L = Hours of wage labour.

The maximisation problem then takes the following form:

$$Max: Max: U(x,v) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$
$$x,v$$
$$\text{subject to: } wT = p_x x + [\, p_o + wH \,]v = p_x x + p_o v \quad \ldots \quad \ldots \quad (5)$$

The price of a visit to the park is thus not only the aforementioned out-of-pocket expenses, but also the income foregone by choosing to visit the park instead of working. Furthermore, the consumer now maximises utility, subject not to the hours of paid work, but to the total household time available. This is termed the 'full income concept'.

The Lagrange expression is:

$$L = U(x,v) + \lambda\,(wT - p_x x + p_v v) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

The necessary first order conditions are:

$$\delta L/\delta x = \delta U/\delta x - \lambda\, p_x = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6.1)$$

$$\delta L/\delta v = \delta U/\delta v - \lambda\, p_v = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6.2)$$

$$\delta L/\delta\, \lambda = wT - p_x x + p_v v = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6.3)$$

These three equations can be rewritten as:

$$\delta U/\delta x = \lambda\, p_x \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6.1a)$$

$$\delta U/\delta v = \lambda\, p_v \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6.2a)$$

$$wT = p_x\, x + p_v\, v \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6.3a)$$

Solving these problems will yield the following ordinary demand function for visits to the park:

$$v = f(p_v, p_x, Y, Z) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Thus, the consumer demand for a visit to a national park depends on the price for a visit, the price for other goods (substitute sites), the income of the visitor/household, and other socio-economic variables. When a demand function has been derived, a next step is to construct a demand curve. The demand curve can be derived by holding income and prices of substitutes constant and vary the price of the commodity (travel cost of a single round-trip to a national park), which generates number of trips to the national park at different travel cost. Once a demand curve has been constructed, the total value of the park can be computed, referred to as consumer surplus. Consumer surplus plus travel cost equals total recreational value of the park.

DATA DESCRIPTION

The data used in this analysis come from Ayubia National Park. The survey was used to obtain the origin and frequency of the visits as well as the visitors' perceived costs. The survey was conducted in summer 2002. The questionnaire consisted of two parts. The first part contained general information about the visitor including gender, education, marital status, age, income, place of living, etc. The second part of the questionnaire is concerned about the visitor's recreational behaviour. The data used in this study were collected from 300 visitors by following systematic random sampling.

Variables and Their Measurement

Economic theory and the considerable experience of recreation managers have shown that demographic and other independent variables are thought to influence recreation visitation. Apart from demographic variables, the most important variables include travel cost, travel time, substitute sites and site quality and congestion. Demographic variables such as age, sex, education, income, employment status, rural versus urban residence, and family size are thought affect recreational demand.

Travel costs also affect the outdoor recreational demand. The relationship between travel cost and park visitation may be negative. Intuitively, age would appear to be an important determinant of demand for park visitation and is expected to be inversely related. That is, as age increases, participation decreases. Sex may be another determinant. We expect that men are more likely to participate than women are. Regarding education, people with higher education would appear to appreciate

outdoor nature-based activities more than people with less formal education. Household income has also, generally, been found to have positive correlation with participation in many outdoor recreation activities. We expect that the higher the household income, the higher number of park visitation. Urban dwellers are likely to participate more than people from rural areas are. People on job are expected to pay more visits to park than jobless people. Better quality of park may attract an individual more often than degraded quality of the park.

Econometric Model

The basic model to be used in this study depicts the number of visits to ANP as a function of factors such as the travel cost, time spent in travelling, a substitute sites, income, education, age, sex, rural versus urban residence, family size, site quality, employment status, etc. Thus, the model may be specified as follows:

$$v_i = \alpha_0 + \alpha_1 TC + \alpha_2 Y_i + \alpha_3 ST_i + \alpha_4 A_i + \alpha_5 E_i + \alpha_{5+k} \Sigma D_k + e_i \quad \ldots \quad \ldots \quad (8)$$

where v_i = the number of visits by the ith individual to the Park per period of time, TC = round trip total cost (Rs) to the site including travel time, M = household income (Rs/month), ST = travel cost to and from a substitute site, A = age of the visitor, E = highest level of education gained by visitor, FS = family size, D_1 = 1 if male and 0 otherwise, D_2 = 1 if urban dweller and 0 otherwise, and D_3 = 1 if the visitor's perception about the site's recreational facilities is good and 0 if bad.

Specification of the functional form is crucial to the benefit estimates obtained. In practice the choice of the functional form needs to be determined empirically. There is some consensus that a semi-log gives the best results namely regressing the logarithm of visitation rates against travel cost, etc. [Bann (1998)]. However, we will also use double log functional form of the above model to estimate (own- and cross-) price and income elasticities of demand for visitation of the Ayubia National Park.

Descriptive Statistics

On average, the sample respondents visited nature-based recreation about 7 times per year with their mean yearly spending on recreation of Rs 5300. Their mean monthly income is Rs 12,500. About 61 percent of the respondents are male and 39 percent are female. As many as 60 percent were married and 40 percent single. The average age of the respondents was 43 years and the average household size was about 6. More than 76 percent were literate and 24 percent were illiterate. Half of the respondents (50 percent) considered quality of the park as good compared to 35 percent who believed it bad or very bad, with about 15 percent answering with don't knows. Majority (60 percent) of the visitors were from urban areas compared to 40 percent of the visitors who were from rural areas. Similarly, more than 62 percent of the respondents wanted improvement in the quality of services of the park. On the

question about how more resources should be allocated for the park management, 38 percent of the respondents preferred an increase in entrance fee, 40 percent chose reallocation of government budget, 22 percent advocated voluntary donations towards parks' management funds.

The visitors visited the ANP for different reasons. Recreational activities at the Park include sightseeing, bird watching, walking, relaxation, exercising, eating seafood, swimming and water sports like boating and sailing. In order to know the purpose of travelling the respondents were asked why they came to Galliat. More than two-third (80 percent) of visitors came to Galliat for recreation purposes. Some 20 percent of visitors reported travelling as the reason for coming to Galliat.

Regarding income distribution as many as 45 percent of sample households fall in income group of Rs 10,000–20,000 per month. More than one-fifth (22 percent) households have monthly income in the range of Rs 5,000-10,000. Some 19 percent households have income of Rs 20,000-50,000. Taken together 64 percent households fall in income range of Rs 5,000-20,000.

Test Statistics

Variables were included on the logic of underlying economic theory. First variables were tested for correlation. According to Loomis and Walsh (1997), an absolute value of 0.8 signifies multicollinearity. The correlation matrix displayed in Table 1 shows no correlation higher than 0.47, which indicates that multicollinearity is not a problem within our data set. All variables could thus initially be included in the analysis.

Table 1

Correlation Matrix of Variables

Variables	No. of Visits V	Travel Cost TC	Income I	Substitute Cost SC	Education Edu	Age A	Household Size HS
V	1.00	–0.39	0.06	0.41	0.37	–0.13	–0.47
TC	–0.39	1.00	–0.37	0.09	–0.17	–0.23	0.21
I	0.06	–0.37	1.00	0.35	0.46	0.39	0.41
SC	0.41	0.09	0.35	1.00	–0.18	–0.15	–0.19
Edu	0.37	–0.17	0.46	–0.18	1.00	0.43	0.35
Age	–0.13	–0.23	0.39	–0.15	0.43	1.00	0.38
HS	–0.47	0.21	0.41	–0.19	0.35	0.38	1.00

ESTIMATION OF BENEFITS BASED ON INDIVIDUAL COST TRAVEL METHOD

Table 2 reports the results of the travel cost regression models in a linear fashion. In these models, most coefficients have the expected algebraic signs. The coefficient on travel costs in negative and statistically significant. As expected high travel costs incurred by individuals are inversely related to park visitation rate. It

Table 2

Estimated Results of Linear Regression Equations

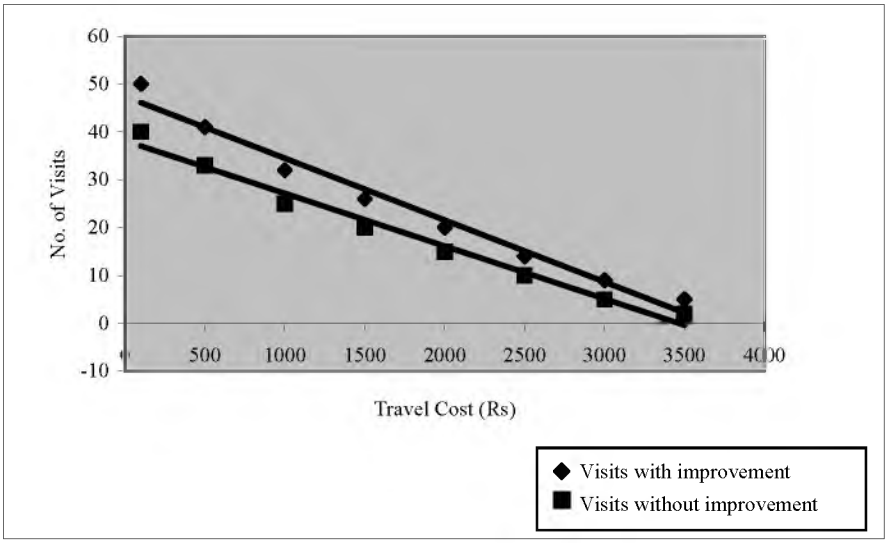
Variable	Coefficients (*t*-stats)
Dependent Variable	No. of Visits
Intercept	2.41 (2.32)
Travel Cost	–0.06 (–2.58)***
Household Income	0.0057 (2.23)**
Price of Substitute	0.00025 (1.75)
Age	–0.024 (–1.69)
Education	0.0059 (1.17)
Family Size	0.0029 (0.35)
Male Dummy 1 (1 for Male)	0.332 (1.54)
Dummy 2 (1 for Urban Dweller)	0.018 (1.40)
Dummy 3 (1 if Visitor's Perception is Good)	0.045 (2.33)**
R^2	0.47
F-statistics	13.5

, and * indicate significance at 5 percent and 1 percent levels, respectively.

implies that the higher the travel cost paid by visitors to reach to the ANP, the less the frequency of their visits. We may thus infer that there is less demand to visit the park by those visitors who live far away from it compared to those who live close to the park. This finding is in line with other such studies [Nam and Son (2001); Landsdell and Gangadharan (2001) and Nillesen (2002)]. In addition to travel cost, household income has positive impact on recreational demand and has the correct algebraic sign. Visitors with high income are willing to pay more visits to the park. This implies that if income level of the visitors increases, so will the recreational demand. There is not a significant relationship between the cost of substitute site and the demand for ANP. This is not in line with the economic demand theory that the demand for a site with increase if prices of substitute sites increase. We however tried to get some crude estimates of the price of substitute site. It is however important to note that the coefficient on substitute price has a positive sign. Education of visitors bears positive sign while age variable has negative algebraic sign. But both these variables have insignificant coefficients.

The dummy variables for male, urban dweller, and good perception of visitors about the environmental quality of the park have positive coefficients. However, only the latter dummy has a statistically significant coefficient. This implies that if the quality of services of the ANP were improved, visitor would like to pay more visits to the park. We have also explored the possibility if the demand curve for ANP will shift upward to the right if its quality is improved. This is shown in Figure 1.

Fig. 1. Park Visitation Demand Curves.

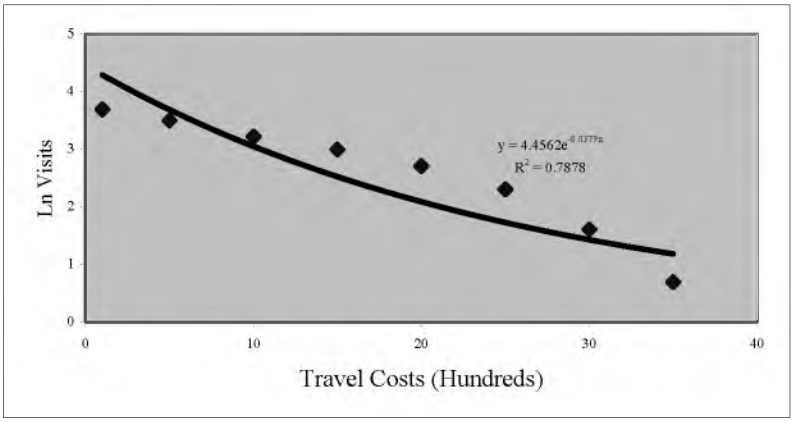


Most of the coefficients have the expected signs. The R^2 shows that about 50 percent of the total variation in dependent variable is the explained variation.

Demand Curves

Two linear demand curves for ANP visitation were estimated from the survey data that are shown in Figure 1. The actual user demand for the Park is represented by Equation 9 as well as the lower curve in Figure 2. Similarly a hypothetical

Fig. 2. Demand for Park Visitation.



demand for the Park in case of improvement in the quality of park services is given by equation 10 and the upper curve in Figure 1. This implies that improvement in the quality of the park services would shift the demand curve upward to the right.

$$v_i = 35.14 - 0.013\ tc\ (R^2 = 0.6313) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

$$v_i = 44.32 - 0.018\ tc\ (R^2 = 0.5666) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

In addition, the log-linear (semi-log) demand curve was also estimated. The semi-log demand curve is curvilinear and convex to the origin, which is relatively flat at low prices and steep at higher prices. It is given by Equation 11 and shown in Figure 2.

$$ln\ v_i = 4.56\ e^{-0.0079tc}\ (R^2 = 0.7878) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

Demand Elasticities

The estimated elasticities associated with the own-price, cross-price, and income variables are shown in Table 3. As is customary, the own-price elasticity is negative and significant at 99 percent confidence level. This may be due to the inverse relationship between travel costs (price) and visitation demand (quantity). Cross price elasticity is positive and insignificant. Finally, the demand for the visitation is significantly income elastic.

Table 3

Estimated Elasticities of Park Visitation Demand

Elasticity	Ayubia National Park
Own-Price	–1.15*** (3.12)
Cross-Price	0.28** (2.27)
Income	0.087** (2.36)

*** Significant at 1 percent level.

** Significant at 5 percent level.

Recreational Value of the Park

Table 4 shows consumer surplus and total recreational value of the Ayubia National Park for the year 2001-02. The total recreational value equals the consumer surplus plus total cost of visit.

Table 4

Recreational Value of the ANP

	Consumer Surplus		Recreational Value	
	Actual	New Scenario	Actual	New Scenario
Per Visitor (Rs)	240.0	320.0	1996.0	2082.4
Total (Rs million)	24.2	35.01	200.6	209.2

Source: Survey.

The annual monetary recreational value of the ANP is about Rs 200 million. This is the value that the park yields every year for the economy. However, this is not the revenue of the park. This value is distinguished into consumer surplus of the visitors and total travel cost of the visitors. The total travel costs paid by the visitors go to transportation companies and agents for service providers such as hotel, restaurants, tourist agencies, etc. In addition, the total recreational value was also projected in a new scenario that amounted to Rs 209 million. The total actual consumer surplus was estimated to be Rs 24.2 million. This shows the value of the benefit that visitors gained by visiting this Park. It also indicates the amount the visitors are willing to pay to enjoy the park's environmental resources like air, water, fish, birds and animals, and scenic beauty. This figure, however, does not show the non-use value of the Park. The annual consumer surplus in case of an improved scenario was projected as Rs 35.01 million.

CONCLUSION AND POLICY IMPLICATIONS

The Ayubia National Park constitutes a valuable environmental resource. Although, at present the visitors do not pay any entrance fee, there is a large consumer surplus of welfare to be gained from the existence of the Park. In future, if the number of visitors to this Park increased, it would, it is expected, become more valuable. Although the estimated recreational value is only one aspect of the total value of the Park, it indicates that, with proper conservation and management, tourism can be a significant source of benefits.

This study constitutes the first estimate of economic values of National Parks and other environmental resources in Pakistan. This type of valuation has implications for management at the ANP as well as other parks at risk.

This Park has high values from both the use (i.e., recreational and tourism, educational and scientific research) and non-use values (i.e., genetic resources, and known and unknown future uses of ecological functions).

The focus of this study is the valuation of environmental resources and how this information can be used to improve planning to national parks management in Pakistan. The Ayubia National Park can generate large economic values through recreation. Keeping in view the large amount of consumer surplus and recreational values of the Park, the Federal and provincial level governments can justify larger annual budget allocation for the management of natural resources.

Alternatively, the government may also consider using entry fee to this Park. The generated 'user value' of the park provides a guideline for the possible introduction of entrance fees and makes a strong argument for sustaining the area, as it is has been demonstrated that benefits derived are large. In addition, the estimated value may also help promoting to sustain other natural areas, which may have not been protected yet, and are thus presumably even more dependent on fair decision-making within the policy arena. Since, the consumers (visitors) are willingness to

pay much higher than they actually pay for Park visitation, an entry fee may be used. This would generate a lot of money that could be used for improving park management.

Critical issues remain to be explored further before the recommended policy for the benefit value capture can be fully realised. These include policy procedures and the process for implementation, including information sharing and consultation. The administrative organisation for implementation and enforcement will also require investigation.

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