Valuing Recreational Benefits of a National Park in Andean Columbia

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Abstract

Protected undeveloped areas are an important tool for land conservation in developing nations. Efficient land allocation decisions and resource management requires knowledge of non-market benefits. Using travel cost and contingent valuation data from on-site interviews and secondary data on visitation, this study will value a national park in Columbia.

Keywords: consumer surplus, non-market valuation, willingness to pay, zonal travel cost.

JEL Classifications: Q24, Q26, Q57.

Introduction

Protected areas such as national parks and wildlife preserves have become the most important and effective mechanism for conservation of the natural environment in developed and developing nations alike. Many protected areas in developing countries are riddled by a myriad of problems stemming generally from conflicts between local people and national governments or international organizations and take the form of increased human activity in and around the park (Shah). Los Nevados National Park (LNNP) in Andean Colombia is by no means an exception to this phenomenon, and illegal anthropogenic disruptions within and around the borders of the park commonly include livestock grazing, fire, agriculture, wood extraction, hunting, and extraction of native flora (Wyngaarden and Fandino Lozano). A wildfire that consumed 2,500 hectares of forest and *paramo* in July 2006, which started as a pastoralist fire, is an example of the threat caused by human activities. Well managed national parks can, however, be sources of direct and indirect revenues that can be used to justify the land allocation decision and help to address this conflict (Mathieu et al.).

Economic valuation of national parks is an important source of information both for park managers and for society in general. Economically efficient resource management requires knowledge of the flow of park benefits and costs, and valuation can be used to measure the benefits derived from the existence of the park (Mathieu et al.). The existence of public benefits derived from a national park in the form of environmental amenities and ecosystem services implies that the park contributes to public welfare, and loss of the park or decline in park quality could result in a loss in welfare (Shah). Information on the economic value of protected areas in developing countries, however, is scarce. This study will estimate the consumer surplus derived

from recreational use of LNNP and visitors' willingness to pay for restoration of the areas damaged by the 2006 wildfires.

Most, if not all of the markets in existence today, are exchange or trading processes for private goods and services. However, not all the goods and services consumed by individuals are private in nature. Public goods and services, such as environmental service flows, are enjoyed by all individuals, yet there is no effective mechanism for allocating them. Some public goods and services, such as national defense, which are produced by human enterprises, have costs that are readily available. In the case of private goods there is an economic value over and above the cost paid to acquire the good, known as consumer surplus. In this manner, the total utilitarian value of a good is the sum of its cost—or paid benefits—and its consumer surplus—or unpaid benefits. The same is true for public goods, whose demand is currently expressed not in markets, but through the political process. The extent to which such demand gets represented, however, is a function of the regulatory and democratic processes that facilitate their expression (Kiker and Lynne).

Travel Cost (TC) and Contingent Valuation (CV) studies are widely accepted methods for non-market valuation of natural systems and amenities. Several TC and CV studies have been conducted in the developing world concerning a diverse array of areas of interest. The initial applications of the non-market valuation in developing countries were primarily in the areas of water supply and sanitation, recreation, and tourism, but the areas of study have expanded to include more difficult to measure values such as for conservation of biodiversity (Whittington). Several studies concerning protected areas in the developing world have been centered on the values and benefits accrued to foreigners rather than locals (e.g. Horton et al.), probably due to their higher incomes and thus willingness to pay estimates.

International tourism in Colombia, however, is weakened by travel warnings, which delineate the dangers that international tourists visiting the country could face. The socio-political context of Colombia, a country in the midst of an armed social conflict worsened by the illicit drug trade, prevents the centering of the study in foreign visitors, which represent a minuscule portion of the users of LNNP. The present study is then centered on the values and benefits accrued by Colombian nationals for the recreational use of LNNP, one of the milestones of their protected areas system.

Data

Primary data on travel costs and willingness-to-pay for this study was obtained on-site from intercept interviews in July 2007. A total of 64 Colombians were approached at the park entrance as they stopped to pay for admission. An additional 4 foreign individuals were approached for interviews following the random selection protocol; as expected, these individuals refused to provide any valuation or socio-demographic information and their responses are not analyzed. The incidence of foreign visitors (less than 6%) does, however, coincide with historical visitation rates.

Respondents were asked to list their expenses for transportation, lodging, equipment rental, and guidance for this trip. Respondents were given the option to answer either as an individual or as a group. Group responses were then divided by group size to estimate individual travel costs. Respondents were then asked how familiar they were, if at all, with the wildfires that occurred in the park during 2006. After briefly summarizing the magnitude of the wildfires, respondents were told that park authorities are considering an increase in the admission fee to

cover the expenses of restoring the areas of the park that were affected by the wildfire. A laminated index card showing the proposed fee increase was then shown to the respondent, followed by the question:

> Please consider how much you spend on recreation each year and your expenses for this trip. Would you have been willing to pay this extra amount per person during this visit to fund park restoration?

Four fee increase levels were used that corresponded with 25%, 50%, 75%, and 100% increases of the existing entrance fee of 8,000 Colombian Pesos (COP) or approximately $4 USD. Regardless of their response, respondents were then asked to provide their maximum willingness to pay (i.e., an open-ended question).

To determine whether the contingent valuation responses were sensitive to the respondent's level of knowledge regarding the park, respondents were also asked about their knowledge of the ecological services provided by the park. This question was administered before the CV exercise in roughly half of the interviews and after the CV exercise in the other half. This survey protocol allows for a test of the effect of information, which park managers could use to improve brochures and perhaps increase visitors' willingness-to-pay. Remaining questions asked about their past visits to the park, their current visit, and demographic information.

Secondary data on historical visitation was obtained from the National Parks Service of Colombia and the private Concession that manages the tourism aspects of the park. The data included detailed information on all park visitors for October and November 2006 and January through May of 2007, totaling 27,785 observations. These data include all visitors' cities of origin, as well as other information. Time-series data on monthly visitation from January 2001 through June 2007 was also obtained.

Methods and Procedures

The Travel Cost Method (TCM) and the Contingent Valuation Method (CVM) were used in this study in a complementary manner. Both the TCM and the CVM have been widely used in valuing different kinds of ecosystems (Maharana et al.). These methods have traditionally been viewed primarily as substitute valuation techniques. In more recent times, however, a different mindset towards ecosystem valuation has been adopted, and CVM and TCM have been successfully combined to estimate welfare measures. This has allowed gains in producing a more comprehensive picture of preferences than what would be available from using either method separately (Kling). This study used both methods but both there are several drawbacks associated with each.

The TCM is a revealed preference method in which the visitor's travel costs to a recreational site are used as a proxy for the value of recreation at that site and their visitation rate shows the amount of recreation they 'purchased' (Navrud and Mungatana). The TCM rose to prominence within the context of federal land use decisions in the United States; Congress voted to prohibit further development of Hells Canyon for hydropower generation in light of the estimated recreational benefits (King and Mazzota). However, the TCM has three main drawbacks as summarized by Stoll (1983): First, the TCM is applicable to specific sites, but is almost impossible to use in evaluating specific components of a site because the site characteristics are not divisible. Second, the TCM cannot be applied with much confidence to very unique recreation sites because the proportion of site users willing to incur greater travel costs than actually borne may be very high. Third, the TCM cannot be applied to sites that are

located in urban areas because those people with higher values for the site may choose to live closer to it, hence their observed values will be lower than their true value.

The CVM is a stated preference method in which survey respondents are confronted with a hypothetical scenario that involves a choice between alternatives with different costs or benefits. Often respondents are asked to consider preferences for improvements in or degradations of natural resource based goods or services by stating their willingness to pay (WTP) or accept (WTA) a given monetary value to get obtain the improvements or avoid the degradation, respectively. Although the hypothetical nature of CVM makes it susceptible to biases, well-structured CVM studies are now accepted as valid methods to assess changes in non-market values due to a change in the level or quality of natural resources and their associated environmental amenities (Navrud and Mungatana; Van Kooten and Bulte). An even larger difficulty with the CVM is the difference between the willingness to pay and willingness to accept values for the same goods and the same individuals. This phenomenon, known as 'cognitive dissonance,' has been exposed empirically by psychologists who have concluded that individuals get attached to the positions that they hold at the beginning of the experiments, as if that position belonged to them by right. Consequently, their willingness to pay to secure a benefit is usually not as high as the willingness to accept to forego the same benefit, and the willingness to pay to prevent a loss is usually not as high as the willingness to accept to tolerate that same loss (Pearce and Turner).

Empirical Analysis

Estimation of Consumer Surplus: TCM

Trip expenditure information from the personal interviews was used with secondary data on historical visitation to complete the TCM analysis. The political division of Colombia into mutually-exclusive states was used for the definition of distinct geographic zones. Visitation rates were calculated using a zonal approach (Navrud and Mungatana; Fleming and Cook) with the following equation:

(1) $V_j = (USERS_j/POP_j)$,

Where V_j = visitation rate for zone j; $USERS_j$ = total number of users from zone j as obtained from the monthly visitor counts; POP_j = Population of zone j from the 2005 census. Use of the zonal approach to capture visitation was necessary since this park is typically visited just once per year; the survey data show a mean number of trips per respondent of 1.14.

Total travel costs per person were obtained by aggregating reported expenditures for transportation, lodging, equipment rental, and guidance costs for those responding on an individual basis or by then dividing by group size when the respondent had chosen to provide group costs. The expenses on an individual basis were then averaged by zone; the results are shown in Table 1. Only states that were both represented in the interviews and the monthly visitation counts were included in the study as valid zones. The lack of travel cost estimates from the states which were not represented in the sample interviews prevented the inclusion of all the states. The states included as zones represent 73.6% of the Colombian population.

Two main limitations to this approach were identified. First, given the socio-political situation of Colombia, both foreigners and nationals are usually fearful of providing information regarding their income. A way around this problem is using the Colombian government's system of socio-economical stratification, in which residential neighborhoods are clumped into one of six different stratums for taxing purposes, with stratum one being the poorest and stratum six

being the wealthiest. In this study, respondents were not directly asked about their income but were asked in which stratum their home was located. This approach complicates the calculation of the value of time since the stratum of residence is only a relative measure of income. Thus, the value of time has been excluded from this preliminary analysis. Second, visitors to LNNP use a variety of transportation methods, including small motorcycles, cars, tourist buses, and chartered buses. This characteristic of travel model creates high variability in travel costs within and among zones as compared to similar analyses (e.g. Navrud and Mungatana; Mathieu et al.; Fleming and Cook). The mean travel expenses by zone were used to address this issue.

Economic theory suggests that the quantity purchased of any good is a function of its price. Given that the zonal TCM uses visitation rates as a proxy for quantity purchased and travel cost as a proxy for price, the following relationship is implied:

(2) $V_j = f(TC_j)$,

that is, the visitation rate in zone j is a function of the travel costs from zone j. Assuming a basic linear relationship, the following empirical equation was estimated:

(3) $V_j = 0.001647^{***} - 4.781E\text{-}9^{*} (TC_j)$ $(R^2 = 0.2558)$

*** Statistically significant at the 0.01 level

* Statistically significant at the 0.1 level

Substituting in the mean zonal travel cost and multiplying by the population of Colombia yields an estimated number of annual visits of 41,100. The actual number of visitors to LNNP during 2006 was 58,659. If we take into account that our monthly visitor counts do not include June and July and December, which along with January are the peak months for tourism in Colombia, the estimate of 41,100 annual visitors seems somewhat accurate.

Consumer surplus is the willingness to pay over and above the price of the trip paid by the consumer (Maharana et al.). The zonal consumer surplus value can then be expressed mathematically as:

$$(4) \qquad CS_j = \int_{TCj}^{TCc} TVj \quad dTC$$

where TV is total visitation from zone j, CS_j is the consumer surplus from zone j; TC_c is the point where demand is choked off (i.e., the price at which no more visitors are willing to travel to LNNP) and TC_j is the average travel cost from zone j. The total consumer surplus can the be found by adding all the zonal consumer surpluses

Total consumer surplus was found to be in excess of 2.7 billion COP, the equivalent of 1.3 million USD. The consumer surplus per person was found to be 87 COP, the equivalent of 4 cents USD. The department of Nariño appears with a consumer surplus of 0, as the actual travel cost per person exceeds the demand choke off price predicted by equation (4). However, visitors from Nariño would in all likelihood choose not to visit LNNP if their CS were really 0 or negative, hence the actual choke off price is most likely above the one predicted using the regression equation. This shows that these figures are very conservative estimates. The summarized CS estimates are shown in table 2.

Estimation of WTP for Environmental Restoration: CVM

The CV portion of the questionnaire included both a closed ended question in which the respondents answered whether or not they would be willing to pay the amount shown in the payment card and an open ended follow-up question in which the respondents were asked their maximum willingness to pay for restoration. An individual's willingness to pay for a good or service is a reflection of preferences and demographic characteristics such as income, age,

gender, education, etc. Information also plays an important role in an individual's willingness to pay for a good or service, as people's knowledge of the benefits from consumption or use of a good or service increase the likelihood of consumption or use.

In the case of restoration of an area affected by wildfires, such as those in the LNNP during July 2007, knowledge of or familiarity with the extent of the fires may also play a role in determining an individual's willingness to pay. The individual's environmental awareness may also play a role in dictating willingness to pay for restoration of a damaged natural resource. In this case study, the value of restoration activities as measured by posing increased entrance fees can then estimated using the following equation:

(5) MAX_WTP = f (KNFIRE, VERS, COMP, I, AGE, ED, SEX)

where MAX_WTP is the maximum willingness to pay, KNFIRE is the respondents' familiarity with the wildfires, VERS is whether the questions concerning the ecological services provided by the park were asked after the valuation question, COMP is a composite measure of environmental awareness, I is income as indicated by stratum in which the respondent's residence is located, AGE is age of the respondent in years, ED is the highest level of education completed, and SEX identifies whether the respondent is male.

Two different functional forms were used in the estimation of maximum willingness to pay for environmental restoration: a linear function and a semi-log function. Surprisingly, both the composite of environmental awareness and age showed negative relation to maximum WTP. The binary VERS variable was found to be positively related to maximum willingness to pay, indicating that respondents were willing to pay higher amounts for restoration if they had not yet been reminded of the ecological services provided by LNNP. Both income and education were found to be positively related to maximum WTP. The SEX variable was found to have a negative

relationship with maximum WTP, indicating that men have lower a WTP for environmental restoration than women. The results of these two regression models are shown in table 3.

The probability that a respondent answers positively to the closed ended portion of the CV exercise can also be expected to be influenced by demographic characteristics such as age, income, education, and gender, as well as information regarding the extent of the wildfires and the ecological services provided by the area to be restored. The respondent's environmental awareness can also be expected to be a factor in determining the probability of responding positively to a closed-ended CV exercise involving the restoration of a damaged environmental asset. More importantly, however, the probability of responding positively to a closed ended willingness to pay question will be determined by the amount shown or given to the respondent as the 'price'. A logit model for the probability of responding positively to the closed-ended CV exercise can then be expressed with the following equation:

(6) YES_WTP = f (ELI_WTP, KNFIRE, VERS, COMP, I, AGE, ED, SEX)

where YES_WTP is a binary variable that takes the form of a 1 when the respondent answers positively and ELI_WTP the amount shown to the respondent in the payment card.

The logit model exhibited a log likelihood of -26.8538 and showed that the price shown in the card is negatively related to the probability of a respondent answering positively to the closed ended CV exercise. A positive relationship between VERS and probability is also present in the logit model. The composite of environmental awareness and age were also found to be negatively related to the probability of exhibiting a positive WTP. Both income and education were found to be positively related to the probability of exhibiting a positive WTP. The logit model then basically reinforces what had been found with the maximum willingness to pay models. The results of the logit model are shown in table 3.

A positive response rate to the closed ended CV question of 81% was observed, but 89% of respondents stated a positive maximum willingness to pay. The mean maximum WTP for ecosystem restoration in LNNP was found to be 6,742 COP, the equivalent of 3.41USD. The mean WTP for ecosystem restoration exhibited in the closed ended exercise was 3,969 COP, the equivalent of 1.98USD. The total WTP for the closed and open ended questions were 245,000 COP and 431,500 COP, respectively (122.5 and 215.75 USD).

Summary and Discussion

Total and individual consumer surplus accruing to Colombian visitors to LNNP was estimated using a zonal travel cost method, and park visitors' willingness to pay for ecosystem restoration was analyzed using a contingent valuation method. The total consumer surplus was found to be in excess of 2.7 billion Colombian pesos or 1.3 million USD. The individual consumer surplus was found to be 87 Colombian pesos. This figure should be compared to the Colombian Parks Service 2007 budget of 13 billion Colombian pesos, which must be distributed among 52 protected areas, one central office, and several regional offices. If LNNP's budget was one-tenth of the entire parks service budget, the consumer surplus would still exceed the allocated budget.

The average willingness to pay for restoration of the areas damaged by the 2006 wildfires ranged between 3,969 and 6,742 pesos for the closed ended and open ended experiments, respectively. If LNNP's management were to actually increase the entrance fee by this amount, they would be able to raise between $232.8 million and $395.5 million pesos, the equivalent of between $116,408 and $197,739 USD for restoration of the areas affected by the wildfires of 2006.

These findings show the economic significance and potential of Los Nevados National Park in particular and of protected areas in the developing world in general. Furthermore, these findings demonstrate that a protected area in a developing country, such as LNNP in Colombia, is a source of public welfare for the citizens of the country rather than a financial burden for the government. The study is also evidence that under innovative management, some protected areas have the potential to cover their own costs, that is, conservation can pay for itself.

References

Fleming, Christopher M. and Averil Cook. "The Recreational Value of Lake McKenzie: An Application of the Travel Cost Method." Paper presented at the 51st Annual Conference of the Australian Agricultural and Resource Economics Society, Queenstown, New Zealand, 13-16 February 2007.

Horton, B., G. Colarullo, I.J. Bateman, and C.A. Peres. "Evaluating non-user willingness to pay for a large-scale conservation programme in Amazonia: a UK/Italian contingent valuation study." *Environmental Conservation* 30,2(2003):139-146.

Kiker, C.F., and G.D. Lynne. "Wetland Values and Valuing Wetlands" In *Ecology and Management of Tidal Marshes: A Model From the Gulf of Mexico* Eds. C.L. Coultas and Y.-P. Hsieh. St. Lucie Press, Delray Beach, FL 1997.

King, D., and M. Mazzota. Ecosystem Valuation, USDA Natural Resources Conservation Service and National Oceanographic and Atmospheric Administration. Online. Available at http://www.ecosystemvaluation.org. Retrieved December 2007.

Kling, C.L. “The Gains from Combining Travel Cost and Contingent Valuation Data to Value Nonmarket Goods.” *Land Economics* 73,3(1997):428-39.

Maharana, I. S.C. Rai and E. Sharma. “Valuing Ecotourism in a Sacred Lake of the Sikkim Himalaya, India.” *Environmental Conservation*. 27,3(2000):269-277.

Mathieu, L.F., I.H. Langford, and W. Kenyon. “Valuing Marine Parks in a Developing Country: A Case Study of the Seychelles.” *Environment and Development Economics* 8(2003):373-390.

Navrud, Stale, and E.D. Mungatana. “Environmental Valuation in Developing Countries: The Recreational Value of Wildlife Viewing.” *Ecological Economics* 11(1994):135-151.

Pearce, D.W., and R.K. Turner. *Economics of Natural Resources and the Environment*. Harvester Wheatsheaf: Hertfordshire, 1990.

Shah, A. *The Economics of Third World National Parks: Issues of Tourism and Environmental Management*. Edward Elgar Publishing. Aldershot, Hants, UK, 1995.

Stoll, J.R. “Recreational Activities and Nonmarket Valuation: The Conceptualization Issue.” *Southern Journal of Agricultural Economics*. December 1983.

Van Kooten, G.C., and E. Bulte. *The Economics of Nature: Managing Biological Assets*. Blackwell: Malden, MA, 2000.

Whittington, D. "Administering Contingent Valuation Surveys in Developing Countries." *World Development* 26,1(1998):21-30.

Wyngaarden, W.V., and M. Fandino Lozano. *Parque Nacional Los Nevados: Un Caso de Seleccion y Zonificacion de Areas de Conservacion Biologica*. IDEADE-DET. Bogota, Colombia, 2002.

Table 1. Travel Cost Statistics, Visitor Count, and Population by Zone

	Individual Travel Costs				
State	Mean (COP)	Standard deviation	N	Visitors (10/06-06/07)	Population (2005 census)
Antioquia	119,854	60,249	10	6,496	5,682,276
Atlántico	162,133	0	1	418	2,166,156
Boyacá	287,238	0	1	251	1,255,311
Caldas	39,042	27,654	12	3,906	968,740
Cesar	81,167	0	1	100	903,279
Cundinamarca	209,146	125,886	12	6,585	9,120,153
Huila	98,000	0	1	263	1,011,418
Nariño	430,857	0	1	71	1,541,956
Quindio	50,556	11,739	3	999	534,552
Risaralda	55,567	25,720	3	1,500	897,509
Santander	227,667	229,574	2	682	1,957,789
Tolima	20,000	0	1	705	1,365,342
Valle del Cauca	157,279	115,163	16	4,270	4,161,425

Table 2. Total and Individual Consumer Surplus by Zone

State	Consumer Surplus (COP)	Average Consumer Surplus (COP/Individual)
Antioquia	671,299,254	118.14
Atlántico	165,314,107	76.32
Boyacá	8,627,127	6.87
Caldas	212,213,688	219.06
Cesar	147,821,575	163.65
Cundinamarca	383,675,355	42.07
Huila	143,051,827	141.43
Nariño	0	0
Quindio	108,921,199	203.76
Risaralda	176,660,526	196.83
Santander	62,818,817	32.09
Tolima	338,906,284	248.22
Valle del Cauca	335,343,553	80.58
Total (COP)	2,754,653,311	87.27
Total (USD)	1,377,327	0.04

Table 3. Data and Regression Results

	Data		MAX_WTP		YES_MAX
Variable	Mean	Std. Dev.	Semi-log	Log	Logit
Intercept			2.26	1,197.0	1.642
KNFIRE			0.66	-229.3	N/A
VERS			1.17*	2,789.0**	0.40
COMP			-0.57**	-509.1	-0.10
I			0.42	979.2	0.34
AGE			-0.004	-91.9	-0.04
ED			1.42**	1,794.0	0.56
SEX			-1.10	-1,404.0	-1.11
ELI_WTP			N/A	N/A	-0.0002
R^2			0.24	0.25	N/A

Note: Double and single asterisks indicate statistical significance at the 0.05 and 0.10 levels, respectively.