SANDEE

Working Paper, No 58 - 11

Valuing the Recreational Uses of Pakistan's Wetlands: An Application of the Travel Cost Method

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ECONOMICS & THE ENVIRONMENT

Published by the South Asian Network for Development and Environmental Economics (SANDEE)
PO Box 8975, EPC 1056, Kathmandu, Nepal.
Tel: 977-1-5003222 Fax: 977-1-5003299

SANDEE research reports are the output of research projects supported by the South Asian Network for Development and Environmental Economics. The reports have been peer reviewed and edited. A summary of the findings of SANDEE reports are also available as SANDEE Policy Briefs.

National Library of Nepal Catalogue Service:

Ali Dehlavi and Iftikhar Hussain Adil
Valuing the Recreational Uses of Pakistan's Wetlands: An Application of the Travel Cost Method

(SANDEE Working Papers, ISSN 1893-1891; WP 58–11)

ISBN: 978-9937-8376-6-8

Key words:
Travel cost method
Truncated count data model
Freshwater ecosystems
Ecotourism
Keenjhar Lake
Pakistan

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April 2011

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SANDEE is financially supported by the International Development Research Center (IDRC), The Swedish International Development Cooperation Agency (SIDA), the World Bank and the Norwegian Agency for Development Cooperation (NORAD). The opinions expressed in this paper are the author's and do not necessarily represent those of SANDEE's donors.

The Working Paper series is based on research funded by SANDEE and supported with technical assistance from network members, SANDEE staff and advisors.

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Abstract

According Global 200, which scientifically ranks outstanding terrestrial and aquatic ecosystems in 238 ecoregions worldwide, the Indus Ecoregion is one of the 40 priority Ecoregions. Keenjhar lake, Pakistan's largest freshwater lake and a Ramsar site, is located in the Lower Indus Basin of the Indus Ecoregion. This study applies a single-site truncated count data travel cost model in order to estimate the value visitors place on recreation in Keenjhar. We estimate the recreational use value associated with Keenjhar lake to be PKR 3.46 billion (or USD 42.2 million). This estimate is based on an annualized mean consumer surplus per visit of PKR 9,500 (or USD 116) and assumes average daily visits of 1,000. Changing the model specification reduces consumer surplus only by about 5%. Policy makers can use these estimates on the recreational value of the lake to assess the returns to conservation investments.

Key Words: Travel cost method, Truncated count data model, Freshwater ecosystems, Ecotourism, Keenjhar Lake, Pakistan

Valuing the Recreational Uses of Pakistan's Wetlands: An Application of the Travel Cost Method

1. Introduction

Keenjhar is Pakistan's largest freshwater lake (14,000 ha) and is situated approximately 120 km north of Karachi with estimated population of 16 mission in 2010. A wildlife sanctuary and a Ramsar site, it is set in a stony desert composed of alternating layers of sandstone and limestone. Approximately 50,000 people, from 12 large and 20 small surrounding villages, are dependent on the lake. Another predominant use of the lake, which might be labeled indirect because consumption occurs off-site, is the supply of water for residential and commercial use in Karachi. The major, direct consumptive use of the lake among the local population takes the form of fishing. However, tourists, mainly from Karachi, also enjoy swimming, boating, and other entertainment activities offered by the Sindh Tourism Development Corporation (STDC) at a resort on the lake's western banks.

A question increasingly asked in the planning and development departments at both the federal and provincial levels is whether public investment for the preservation of natural assets provides commensurate returns. The STDC, for instance, received PKR 2.5 million (or USD 42,000) worth of grant-in-aid in the Fiscal Year 2004-2005. However, it recently requested approximately the same amount as a one-time grant to help overcome its "financial crisis".[1] Faced with increasing pressure to justify the monies it receives from the government, STDC, a public limited company, has shown an interest in being able to provide an estimate of the economic value of the recreational services it manages. The timing could not have been better. Receptiveness of policy makers to such studies, both in terms of accepting the validity of valuation study results and the application of such results for the purpose of policy planning, has accelerated in the past five years. The federal government also plans to use valuation estimates in the context of green accounting. It already places the cost of environmental degradation at 6 per cent of the Gross Domestic Product (World Bank, 2006). At the provincial level, the Planning and Development Department of the Government of Sindh has considered the possibility of using valuation study estimates to determine budgeting in its planning cycles.

In this study we estimate access values to Keenjhar using a travel cost model (TCM). This we hope would replace existing decision-making with regard to pricing which does not rely by and large on quantitative tools but on intuition and experience. Adding the use value of recreation to the already measured use value of fisheries and other indirect use values such as the water supply to Karachi when determining the need to preserve Keenjhar would provide the policy planners with more accurate estimates of its value when deciding between competing uses of the lake such as an exclusive focus on commercial fisheries and water supply that precludes tourism. After reviewing the existing literature, we have confined our modeling approach to a count data model for a single site. Our analysis addresses issues associated with multiple purpose trips and the impacts of labor decisions on time valuation, in addition to truncation and endogenous stratification.

We further apply a basic model of the Travel Cost Method to a subset of visitors using charter transportation. Charter transportation generally refers to mini-bus or vans used by large families. Our data permitted us to analyze welfare impacts when visitors had different embarkation points for their trip to the Lake. It is often assumed that charter transport users do not incur additionaltravel and time costs before boarding their charter transport. Our study suggests that this assumption is un-realistic and results in an underestimation of consumer surplus values. Thus, we propose that data collection and processing strategies need to be revised since shared and rented

[1] Government of Pakistan. 2009. "Sindh Tourism Development Authority (STDC), Culture Department, Government of Sindh", (www.sindh.gov.pk, accessed on 15.10.09).

transportation is common in developing countries. This study is among a handful of studies in Pakistan to estimate non-market values for public policy purposes. We only know of one other study (Khan, 2004) that adopts the Travel Cost Method (TCM) for the purpose of shaping national policy on the regulation of a national park in Islamabad.

2. Justifying Ecotourism Investment: Answers to Economic and Financial Questions

The total economic value of Keenjhar Lake, based on a recent estimate of the direct consumptive use value (i.e., the producer surplus from commercial fisheries), the indirect use value (i.e., the residential water supply to 1 million of the 15 million population of Karachi), and the non-use value (based on an application of the "choice experiment" technique administered in Karachi to examine the willingness to pay for species protection) is in the order of PKR 9 billion (or USD 145 million) (Dehlavi *et al.*, 2008).[2] In discussing the application of total economic value estimates for the purpose of modifying Pakistan's national income accounts, the authors note that tourism – which was omitted in the study's analysis of Keenjhar – can significantly augment the direct use value estimates. A recent study on the Okavango Delta in Botswana, for instance, found the Social Accounting Matrix based gross national product multipliers, when estimated for tourism, to be significantly greater than those estimated for household, agricultural and natural resource harvesting/processing activities (Turpie *et al.*, 2006).

At present, STDC does not employ valuation or similar advanced quantitative techniques in their planning or pricing of accommodation and recreational activities. This is unfortunate as models of recreational demand can be put to a number of uses, including addressing economic (for e.g., measuring the welfare derived from the reserve) as well as financial (for e.g., responsiveness to cost components with bearing on overall revenue or revenue per unit of on-site paying activities) questions. This paper addresses the economic question of whether investments in recreational sites provide a return on equity by estimating the monetary value associated with the recreational uses of the Lake.[3]

We consider labor market constraints while estimating time costs by distinguishing between recreationists who are committed to a fixed work week and fixed vacation allotments and those who are not constrained in this fashion. The approach we adopt was formalized by Bockstael, Strand and Hanemann (1987) who found discontinuous labor market constraints to lead to corner or interior solutions. In their paper, they identify several types of workers among those who are employed but unconstrained, including those who avail themselves of overtime work at a higher wage rate and those who get additional part-time work at a lower wage rate. As elaborated below in Section 5.5, in the case of individuals who are able to choose the number of hours worked, we collapse time and money constraints into one to form a full income constraint.

In the case of Keenjhar, it is necessary to take into account public concerns regarding polluted water because of its recreational,domestic and commercial uses by Karachi and a local population of 50,000 persons, mainly inhabitants of the surrounding twelve large and twenty small villages (WWF, 2006). Among the factors contributing to the pollution of the lake are upstream tanneries, sewerage, and grease from vehicle-washing and motorized fishing boats. In a noteworthy economic and epidemiological contingent valuation survey undertaken at two beaches, Lowestoft and Great Yarmouth, in Eastern England, Georgiou *et al.*, (1996) established that the British public was prepared to pay an amount in excess of the total clean-up cost that would be incurred to bring British beaches up to the standard required by the European Community (which in 1995 was approximately GBP 9 billion).

3. The Study Site and Sampling

Our choice of a study site in part was motivated by the STDC's own interest in providing economic values for the recreational services it provides. However, in addition to aiding management decisions, we were also interested

[2] The purpose of economic valuation is to reveal the true costs of using scarce environmental resources. A Total Economic Value is by definition the arithmetic summation of the monetary values estimated in Direct Use Value, Indirect Use Value, and Non-Use Value studies. For an overview of valuation, including definitions of direct, indirect, and non-use values, as well as a critical survey of the application of valuation techniques to environmental problems in developing countries, see Georgiou *et al.* (1997).

[3] While financial issues are pertinent for reserve managers who are attempting to maximize revenues, the present paper neither models on-site paying activities nor site quality. However, the data generated by modules in our questionnaire relating to both these issues is available on the SANDEE website (www.sandeeonline.com).

in complementing our understanding of Keenjhar's total economic value estimate of PKR 9 billion (USD 145 m) (Dehlavi *et al.*, 2008). We wish to note here that our demand model does not include substitute sites, the principal reason for this being that no other tourism facility in Sindh is attached to a lake providing water-based recreational services such as boat rides, rubber tube rentals, and clean bathing water.

We carried out a seven-day reconnaissance survey (in February and March of 2009) for the purpose of designing a reliable survey instrument. We conducted a count at the two entrance gates of the site which showed that 5,892 individuals had visited it during this period. Visitors came from 13 districts in the Sindh province, with the highest number of visitors traveling from Karachi, followed by Thatta and Hyderabad (see Figure 1). The count showed that most visitors were day trippers (98.5 per cent).

Figure 2, which offers a map of Sindh, shows the per capita visitation rates for the 7-day period from the 13 districts. In the Figure, we have magnified Karachi in order to show per capita visitation rates from within the 18 towns of the city. The number of visitors from the town of Saddar is higher than that from all 12 districts combined except for Karachi while the number of visitors from the town of Korangi is higher than that for the entire district of Hyderabad.

Based on the findings from the reconnaissance survey, we added some innovative questions to final questionnaire. These questions identified within-city travel costs for those using chartered transport to Keenjhar. Generally, chartered transport refers to the renting of a bus/van typically by a single but large family. As there was no reason to assume that all members of an extended family were picked up from their front door, we asked respondents using chartered transport if they incurred time and petrol costs to reach a "common point of departure". During the main survey, the chartered mode remained the most popular (59 per cent), with only a fraction not picked up from home and thus incurring travel costs before boarding the chartered transport (this is elaborated in Section 6.2). Privately owned cars (35 per cent) and motorcycles (6 per cent) came second and third among preferred modes of travel.

We designed a sampling plan for 1,000 observations (see Table 6). We assigned weights based on the total observed participation in: (a) activities by zone (there are two zones spanning the STDC resort's 2 km stretch, which we have named Zone A and Zone B for our purposes); (b) activities by each day of a 7-day week; (c) activities by time periods within a single day (these were: 07:00-10:30, 10:30-13:30, 13:30-16:30, 16:30-19:30); and, (d) activities by category (with 9 categories of activities). This formulation yielded a convenient way to determine the specific number of questionnaires to be filled within a given zone, day, time, and activity category. The final, right-most columns of our data collection strategy tables (see Sampling Plan) also use district weights to determine the desired number of observations from Karachi, Thatta, Hyderabad, and an aggregated "Other Districts" class (see also Figures 1 and 2).

The main survey was conducted from 12th to 18th August, 2009 (from Wednesday to Tuesday), and coincided with a national holiday, the Pakistan Independence Day, which fell on a Friday in 2009.[4] The survey yielded a sample of 741 visitors. While this assured a high number of visits from Friday to Sunday, it may also have caused an oversampling of the salaried class. We exploit this factor in our model which addresses the impact of labor decisions on time valuation. We conducted the survey each day from 08:30 to 19:00 hours. We selected a site-based sample owing to resource constraints. We adopted a systematic sampling strategy because a simple random sampling requires a sampling frame (i.e., a listing of every unit in the population) which was not feasible given our time- and resource-constraints. Within this sampling strategy, we attempted random selection through sub-dividing Zones A and B at the site into clusters or lots. Enumerators wore WWF caps and approached respondents using a standard preamble to introduce the survey. The enumerators presented the respondents with modules relating to household income and other private information only after other modules that engaged their attention and interest.

[4] In Pakistan, officially Fridays are working days and Saturdays are half-days (for bank and government employees). The Independence Day, which is celebrated on August 14th, is a gazetted holiday. As Independence day fell on a Friday, the visiting public at Keenjhar is likely to have taken leave on Saturday in order to enjoy a full three day break.

4. Descriptive Statistics

Table 1 provides the expected signs for our explanatory variables along with associated hypotheses and descriptive statistics for our full sample of 741 individuals. It should be noted that distances in the Table are those using GIS owing to obvious inaccuracies in distances reported (see 5.6 below for discussion). While the maximum monthly household income was PKR 1 million, the average monthly income was equal to or below PKR 30,000 for as much as 66 per cent of our sample. Although the maximum travel time reported was 30 hours, we found this to be improbable and corrected it as described in section 5.6. The furthest distance travelled was for a single party from Shikarpur District, representing a distance of 487 km, which can be covered in about 8 hours.

5. Methods

The paper aims to estimate access values to Keenjhar using a travel cost model (TCM). After describing the theoretical construction of our TCM, we also describe welfare measurement using a Poisson regression model. We discuss the TCM hypotheses throughout, including an outline of the analytical techniques used to address the separate issues of multiple purpose trips, the impact of labor decisions on time valuation, truncation and endogenous stratification.

5.1 The Model

The basic recreational demand model for the TCM used in this paper may be written as follows:

$$x_i = x(z_i, \beta) \quad [1]$$

where the demand for recreation, variable x, can take an integer value from 0 to k; z_i is the row vector of M demand arguments (including the vector of prices and qualities for recreational sites and the amount of income that could be earned if the person worked all of the available time); and, β is an $M \times 1$ column vector of parameters to be estimated. Environmental resources in Pakistan, as elsewhere, are frequently the focus of recreational trips. As evidenced in our reconnaissance survey, many households, especially from Karachi, take time out to spend at least a whole day wading, floating about on a rubber tube, boating, or simply sitting on the lawn of rented accommodation to observe the Keenjhar Lake. Environmental economists have sought to model the demand for such trips as a means of estimating the welfare value that people derive from having access to natural resources such as the Keenjhar Lake. Conventional welfare estimation techniques are not applicable because access to these resources frequently does not command a price, or at least not one that is high enough or exhibits sufficient variation to directly estimate a demand curve.

TCMs are based on an idea first put forward by Hotelling (1949) and described succinctly by Hof and King (1992). Researchers can derive resource values through the use of TCM by estimating a demand curve for complementary market goods (for e.g., a day visitor's costs of travelling to Keenjhar) and calculating the welfare value for the household by integrating between the present price faced by the household for the complementary good and the choke price, i.e., the price at which the quantity demanded goes down to zero.

5.2 Welfare Measurement

In our study, we calculate the welfare measurement or the value of access to Keenjhar in its general form which is calculated as the willingness to pay for use of the site where the alternative is foregoing its use. The computation then is that of the area under the utility-constant demand curve for the site, or the income-constant demand curve, given expected low income effects and budget shares of recreational demand models (Haab and McConnell, 2002):

$$WTP(acess) = \int_{p_i^0}^{p^*} f\left(s, C_{2i} + w_i t_{2i}, y_i^f\right) ds \quad [2]$$

where $P_i^0 = c_{1i} + w_i t_{1i}$ (here P is the price of a trip to the primary site) and P^* is the relevant choke price (note that $c_{2i} + w_i t_{2i}$ denotes travel cost to the substitute site, c denotes the round-trip travel cost, w is the after-tax wage rate, and t is a unit of time for the trip, while y_i^f is a measure of full income, i.e., the amount that would be earned if all available time were used up for work, and s is the dummy variable of integration). Each household is denoted by i, while subscripts $_1$ and $_2$ index primary and substitute sites.

A gate-count during the reconnaissance survey, conducted for one week in February and March, 2009, confirmed that the number of visits to the lake's tourism resort could exceed one thousand a day. However, this represents only a fraction of Sindh's population of 55 million. In such a scenario, an effective sampling frame construction for a population-based TCM is expensive. Due to resource constraints, we therefore used a site-based sample so that the number of visits, the dependent variable in our regression analysis, takes on positive integer values or counts. Other authors have included aggregate data in country-level TCMs that could also include non-visitors in the count models (Hellerstein, 1991).

As ours is an on-site sample with the number of visits expressed as counts, we employ the Poisson regression model to estimate the demand for recreation, whose probability density function is given by (Haab and McConnell, 2002):

$$\Pr(x_i = n) = \frac{e^{-\lambda_i}\,\lambda_i^n}{n!}, n = 0, 1, 2, \ldots \quad [3]$$

It is worth noting that the parameter λ_i is both the mean and the variance under the Poisson distribution. Statistical tests of this equality often suggest that such a condition is violated in the context of recreational data. Furthermore, it is common to specify this parameter as an exponential function since it is necessary that $\lambda_i > 0$:

$$\lambda_i = \exp(z_i\beta) \quad [4]$$

When calculating the willingness to pay for access using the Poisson regression model and assuming an exponential function, the choke price is infinite. Defining P^0 as the current travel cost, consumer surplus for access is given by (Haab and McConnell, 2002):

$$WTP\ (access) = \int_{P_i^0}^{\infty} e^{\beta_0+\beta_1 s} ds \quad = \left[\frac{e^{\beta_0+\beta_1 s}}{\beta_1}\right]_{P_i^0}^{P\to\infty} = -\frac{x}{\beta_1} \quad [5]$$

When $\beta 1 < 0$.

The Poisson regression model is commonly used in recreational demand models (von Haefen and Phaneuf, 2003). However, the Poisson regression model is subject to misspecification owing to its implicit restriction on the number of counts: $E\ (x_i|z_i\beta) = V\ (x_i|z_i\beta) = \lambda_i$ (the conditional mean and variance are equal). One consequence of variance exceeding the mean (overdispersion), as is characteristic in recreational data, is that the Poisson regression model's standard errors are underestimated, leading often to the rejection of the null hypothesis of no association. The Negative Binomial can be used to test for overdispersion, a common version of which is a Poisson regression model with a gamma distributed error term (Greene, 2005). In such a case, the Negative Binomial's probability function can be written as (Haab and McConnell, 2002):

$$\Pr(\mathrm{x_i}) = \frac{\Gamma\left(\mathrm{x_i} + \frac{1}{\alpha}\right)}{\Gamma\left(\mathrm{x_i} + 1\right)\Gamma\left(\frac{1}{\alpha}\right)} \left(\frac{\frac{1}{\alpha}}{\frac{1}{\alpha} + \lambda_i}\right)^{\frac{1}{\alpha}} \left(\frac{\lambda_i}{\frac{1}{\alpha} + \lambda_i}\right)^{\mathrm{x_i}} \quad (6)$$

where $\boldsymbol{\lambda_i = \exp(z_i\beta)}$. The mean of the Negative Binomial distribution is $\boldsymbol{E\ (x_i) = \lambda_i = \exp(z_i\beta)}$. The variance is $\boldsymbol{V\ (x_i) = \lambda_i\ (1 + \alpha\lambda_i)}$. The α parameter is the overdispersion parameter. If $\alpha > 0$, overdispersion is said to exist. If $\alpha = 0$, no overdispersion or underdispersion exists and the Negative Binomial collapses to the Poisson distribution in

the limit. If, on the other hand, $\alpha < 0$, the data are underdispersed so that the Poisson regression model should be rejected in favor of the Negative Binomial model, revealing that the test is also one of the Negative Binomial models against the null hypothesis of a Poisson.

5.3 Endogenous Stratification and Truncation

Due to resource constraints, we were only able to sample visitors who came to visit the lake. Count models with truncated samples, that is, models where only those visiting the site are sampled, must make use of the appropriate functional form but also be observant of the effects of functional form choice and truncation on consumer surplus estimates (Ozuna *et al.*, 1993). The class of permissible functions depends on the distribution assumed.

In this instance, we expect the sample average number of trips to be higher than the population mean (endogenous stratification) since our on-site interviewing process is inherently likely to have intercepted avid visitors to Keenjhar (see Section 6 below for actual outcomes). To obtain the correct likelihood function, we need to account for this oversampling of visitors who have a high use level. We can estimate the endogenously stratified and truncated Poisson Regression Model by running a standard Poisson regression of $\chi_i - 1$ on the independent variables (Englin and Shonkwiler, 1995) while we can write its probability as (Haab and McConnell, 2002):

$$h\left(x_i and\ interview | x_i > 0\right) = \frac{e^{-\lambda_i}\,\lambda_i^{w_i}}{w_i!} \qquad [7]$$

where $w_i = \chi_i - 1$ and the right hand term is the probability function for a Poisson distribution for the random variable w_i.

To address overdispersion relative to the Poisson, truncation at zero, and endogenous stratification due to oversampling of frequent visitors at Keenjhar, we make use of the endogenously stratified truncated negative binomial distribution (see Equation 8 below). For purposes of selecting the best performing functional form, as discussed below in section 6 and shown in Table 1, we shall compare the Poisson to the Negative Binomial. It is to be noted that were data to be equidispersed but still truncated and endogenously stratified, fitting this model is equivalent to running a zero-truncated Poisson (Haab and McConnell, 2002).

$$\mathrm{h}(\mathrm{x_i and\ interview} | \mathrm{x_i} > 0) = \frac{\mathrm{x_i}\Gamma\left(\mathrm{x_i} + \frac{1}{\alpha}\right)}{\Gamma\left(\mathrm{x_i} + 1\right)\Gamma\left(\frac{1}{\alpha}\right)} \left(\frac{\frac{1}{\alpha}}{\frac{1}{\alpha} + \lambda_i}\right)^{\frac{1}{\alpha}} \left(\frac{\lambda_i}{\frac{1}{\alpha} + \lambda_i}\right)^{\mathrm{x_i}-1} \qquad [8]$$

5.4 Multiple Purpose Visits

The standard travel cost modeldistinguishes single purpose visits from multiple purpose visits, e.g. visits made to destinations on the way to Keenjhar or on the way back home. This turned out to be very important since as much as 42 per cent of our sample undertook incidental visits. Using a somewhat recent approach (Parsons and Wilson, 1997), we interact a dummy variable with price to capture both the shift and rotation of the demand function due to the existence of complementary sites, thereby adjusting the reported total trip cost of multiple purpose visitors in our sample. Without this modification, we would erroneously be attributing all out-of-pocket cost and travel time to Keenjhar for such visitors. The result, if such were the case, would likely be an exaggerated consumer surplus estimate due to a biased site price coefficient.

Our survey instrument was designed to isolate individuals who undertook incidental visits to complementary sites, among which the most popular for Karachiites were the Badshahi Masjid (an ancient mosque of historic value), Bhamboor (an outdoor museum), and Makli and Chowkandi (tombs with a historical significance). Parsons and Wilson (1997) use the term “incidental consumption” to refer to trips whose primary purpose is to visit a designated recreation site but which may also include some incidental side trips, which would necessarily be foregone if the trip to the primary site is not made for some reason. In contrast with this approach, which treats incidental trips as a good that complements the primary trip, are the dual-purpose trips in which authors have identified “joint consumption” where the decision to forego one trip will lead to the foregoing of the other. The theory of incidental

consumption is able to allocate total trip cost between the recreation trip and side trips, something scholars argue is also possible in the case of joint consumption.

In our study, following Parsons and Wilson (1997), we first ignore the effects of incidental consumption. We then include an indicator variable for multiple destination visits (allowing interpretation of the "differential intercept") to account for the effects of incidental consumption following which we apply a fully interacted/saturated model in which the indicator variable is interacted both with travel time (for "constrained" visitors only, as defined in Section 5.5 below) and, more importantly, with the price variable (allowing interpretation of the "differential slope coefficient").

5.5 Implications of Labor Decisions on Time Valuation

Our model also attempts to reflect the implications of labor decisions on time valuation (that is, on the opportunity cost of time) and allows these decisions to vary over individuals in our sample. In particular, adopting an approach based on Bockstael, Strand and Hanemann (1987), we distinguish visitors to Keenjhar who give up on the opportunity to earn income for a day trip to the Lake from those who do not face any such trade off. The "unconstrained" category is different from the "constrained" one in that it describes individuals whose labor/leisure choice is at an "interior" and whose opportunity cost of time is reflected in the wage rate. While arguments in the demand function for the corner solution includes travel time, we do not include discretionary time in our model as overnight stays at Keenjhar are rare (see their modeling structure below). We nevertheless generated the data for discretionary time, which may be used in future studies.

The modeling structure adopted by Bockstael, Strand and Hanemann (1987) is:

$$x_i = h^I(P_i + w_D t_i, P^o + w_D t^o, \bar{Y} + w_D \bar{T}) \quad [9]$$

$$x_i = h^C(P_i, t_i, P^o, t^o, \bar{Y}, \bar{T}) \quad [10]$$

where Equation 9 describes the number of trips demanded for an type *i* of good (i.e., recreational type) by unconstrained individuals and Equation 10 describes this with reference to constrained individuals; P_i is the travel cost and t_i is the travel time, both associated with the recreational good; w_D is the wage rate received in discretionary employment, P^o and t^o are vectors of money and time costs of all goods other than *i*; and, $\bar{Y}$ and $\bar{T}$ are non-wage income / income from non-discretionary employment and time available for discretionary activities, respectively. We have collapsed time and budget constraints into a single constraint in the case of Equation [9], which describes "unconstrained" individuals, while time and budget constraints are separately binding in the case of Equation [10] "constrained" individuals. Further, in our case, we have not used P^o and t^o.

5.6 Organizing and Turning Data into an Observation Set

Before analyzing the data, we had to shape the data into a workable structure. Besides adjusting our survey data for multiple purpose visits and alternative specifications for the time variable (see 5.4 and 5.5 above), we made adjustments for inaccuracies in reported distances while we included factors to account for depreciation and operating costs associated with privately owned vehicles. We observed that there was a discrepancy between the fees advertised by STDC at the entrance gate (on individuals and vehicles) and what visitors reported they had paid. Our dataset revealed that visitors were either overcharged or undercharged but by amounts that are negligibly higher or lower than the advertised fees. Our TCM therefore uses entrance fees as they were reported by visitors. However, when estimating changes in consumer surplus from simulated increases in entrance fees, we used advertised fees only for car owners since individuals using shared transport like buses were unaware of the vehicle and entrance fees paid on their behalf, being aware only of their share of the total cost of the outing. In our model, we calculate the opportunity cost of time as 30 per cent of the estimated wage rate, which is calculated as the reported aggregate per month household earnings times 12/ 2,000.[5]

[5] We calculated the yearly hours based on survey responses and the April 2009 Government of Pakistan "Time Use Survey".

Owing to obvious inaccuracies in reported distances, we relied on GIS to impose maximum and minimum limits for distances covered by visitors from each of the 17 districts in our sample. This permitted us to use plausible reported distances in our model. Plausibility was essential owing to the fact that we used two-way distances to calculate petrol costs as well as depreciation and operating costs for vehicle owners in our sample.

Based on information from local original equipment manufacturer engineers, representatives from the insurance industry, and the Pakistan Automotive Manufacturers' Association, we employ a declining balance method to calculate vehicle depreciation, relying on an industry average depreciation figure of 10 per cent per annum (with engine life at 300,000 km). We base vehicle operating costs on a schedule obtained for a 2009 four-door Suzuki Cultus 1000 cc, which includes 22 components (but excludes any costs that are not marginal in nature such as registration and license fees). We calculate the two-way per kilometer petrol cost based on August 2009 Oil Companies Advisory Committee data for diesel, petrol and compressed natural gas, which benefits from interviews with experts on fuel efficiency for various models of privately-owned cars and motorcycles. The annotated calculations are available in our STATA-10 routine.

6. Results and Discussion

We began by selecting the best estimator for our TCM through estimating two simple versions of our model, one version of which uses travel cost and income variables while the other adds travel time as a separate variable for so-called "constrained" individuals (that is, those without wage income). As shown in Table 2, the two estimators tested were the Poisson and Negative Binomial, both corrected for zero-truncation and endogenous stratification. As overdispersion is characteristic in recreational data, the Negative Binomial tested for overdispersion which is discussed in Section 6.1 below. We selected the Poisson over the Negative Binomial, partly owing to the travel cost variable of the former the coefficient for which showed significance at the 1 per cent level and 5 per cent in Models 1 and 2 respectively and partly because the signs for income in the negative binomial regressions were negative.

Having determined an appropriate model, we applied the endogenously stratified and truncated Poisson alone to estimate demand models, the first time using seven variables and the next time eleven. In each of the seven- and eleven-variable versions of the TCM, we carry out one regression in which incidental consumption effects are ignored (Model 1); one in which an indicator variable for multiple destination visits is included (Model 2); and a third one, a fully interacted model, in which the indicator variable is interacted with the price variable and travel time (Model 3). We present descriptions of and results for seven- and eleven-variable models in Tables 3 and 4 respectively (see Table 1 for definitions of variables and associated alternative hypotheses).

6.1 Estimator Selection for the TCM

We begin by noting some interesting results from the estimator selection process before proceeding to discuss the travel cost model. Firstly, in the case of the endogenously stratified and truncated Poisson, the signs of our coefficients were as expected (see Table 1). Secondly, for the purpose of computing the marginal change with variables held at their means (marginal effects after regression), it is possible to interpret the coefficient of the total trip cost (our "TC" regressor) as a semi-elasticity showing the per centage by which visits would drop for a single unit (i.e., PKR 1) increase in TC. The coefficients show an extremely low degree of elasticity in both models. As discussed in Section 3 above, a Keenjhar trip is a unique and high quality recreational experience and, based on the empirical evidence reviewed in Woodall *et al.* (2002), unique and high quality recreational experiences have been shown to have low price elasticities. In an analysis of day trips to Canyon County for wine tourism, the same authors include a "stay home" dummy variable which confirms the site in question to be unique, with few substitutes. While we do not include such a variable in our demand model, we note that of the 70 per cent in our sample that responded to the following statement, "if Keenjhar was not visited today, we would instead have spent the day at…", 94 per cent indicated "home". Other answers included four categories created by regrouping themes, namely, "friends, relatives, school", "business, shop, office, hospital", "other recreational sites", and "city/district names".

For the Negative Binomial given in Table 2, we tested the null hypothesis of $\alpha = 0$ (i.e., no overdispersion exists) and found α not to be significantly different from zero (the t-statistic is nearly zero and insignificant in Models 3 and 4,

with and without the "time" variable). Our null hypothesis cannot be rejected at any reasonable significance level and, as we do not observe overdispersion, we favor the endogenously stratified and truncated Poisson over the Negative Binomial regression corrected for endogenous stratification and zero-truncation.

As ours is an on-site sample with self-selection on the part of those who go to Keenjhar, the data are truncated because we include only participants in the analysis ($\chi_1 \geq 1$ for all observations). We undertook a zero-truncated Poisson regression model to address this fact. Again, owing to the fact that ours is an on-site sample, we are inherently likely to have intercepted avid visitors to Keenjhar. The endogenous stratified truncated Poisson addresses this problem because we expect the sample average number of trips to be higher than the population mean. With reference to coefficients presented for all estimators in Table 2, it is worth mentioning at this stage that the monthly income coefficient is not significant in any of our regressions.

6.2 Estimation of the TCM Model

We discuss here the results for the selected estimator, the zero-truncated and endogenously stratified Poisson regression model (see Tables 3 and 4). We first discuss the seven-variable model. Its overall significance (as measured by $Pr > \chi^2$) was 0.0000 in all three models. The sign of the coefficients across all variables in Table 3 is as expected (see Table 1), with the exception of the "married" variable in the case of Model 1. In general for travel cost models, when displaying marginal effects we are presented with the predicted number of events in the dependent variable (i.e., number of trips in our case) against each of the independent variables. With such semi-elasticity data, we can infer per centage increases or decreases in the predicted number of events by multiplying the data by unit decreases/increases in the corresponding independent variable. Based on a high Pseudo R^2 value as compared to Models 1 and 2, we examine the marginal effects in Model 3 of Table 3. Here, we observe that trips are predicted by the Model to increase by 0.03 per cent for a PKR. 100,000 increase in monthly income. If we look at elasticities after Poisson, a 10 per cent increase in travel costs would result in a 1.3 per cent decrease in the frequency of trips. It is noteworthy that our travel cost variable is significant at the 5 per cent level for all three models in Table 3.

The coefficient of monthly income is insignificant in all the models in Table 3. Considering that nearly half the sample has undertaken an approximately 3-hour long journey, it is encouraging to see that our travel time and residence variable coefficients (whether travel has rural or urban origin points) are significant in all models at the 10 per cent level. Supporting our hypotheses that males, more importantly single males, face nominal constraints when it comes to traveling unaccompanied and exercising travel decision prerogatives, gender and married coefficients show significance at the 5 per cent and 10 per cent levels respectively. The link between the decision to travel to Keenjhar and the preference for water-based activities appears to be supported by the significance of the coefficient of our "water based activities" variable at the 10 per cent level except in Model 3. The coefficient of the dummy variable for multiple purpose visits is highly significant in Model 2 but not so when interacted with travel time in Model 3. This is elaborated further in the discussion on multiple versus single purpose visits below. Exploiting the general expression in Equation [5] for Model 3 in Table 3, we calculate the willingness to pay for access to Keenjhar Lake as the sample mean of the consumer surplus, namely, a mean consumer surplus per visit of PKR 9,515 (USD 115).[6] Failure to account for the on-site nature of the sample results in an overestimate of 18 per cent of the sample mean willingness to pay.

The mean consumer surplus result relates to Model 1 and needs to be interpreted in light of Models 2 and 3 in Table 3 which address incidental visits to complementary sites such as Badshahi Masjid, Bhamboor, Makli and Chowkandi (see Section 5.4 above). In Model 2, following the introduction of an indicator variable, the statistical significance of the differential intercept (the coefficient of the dummy variable for multiple visits) implies that the intercept for the multi-purpose trips (the 58 per cent of our sample undertaking single purpose visits and the 42 per cent undertaking multiple purpose visits) is different. As the coefficient is positive, the incidental visits may be said to serve as complements (Loomis *et al.*, 2000). We chose not to calculate the mean consumer surplus per visit corrected for multiple purpose visits. The latter is calculated much like Equation [5], except that the denominator consists of the arithmetic sum of the travel cost coefficient and the differential slope coefficients. We did not undertake the calculation because, while the intercepts of the dual trip groups are different, as indicated

[6] That is, average consumer surplus equals the negative inverse of the travel cost coefficient.

by the differential intercept coefficient's statistical significance and the fact that side visits act as complements, as indicated by the positive sign of the differential intercept, the differential price slope coefficient was not statistically significant. This implies that the slopes, and thus consumer surpluses, of the dual-trip groups are not different, and we are not in a position to observe a rotation of the demand curve for multiple destination trips by the magnitude of the slope coefficient (Loomis *et al.*, 2000).

As per Section 5.5 above, we estimate all our regressions in Tables 3 and 4 while segregating visitors to Keenjhar who forego the opportunity to earn income for the purpose of enjoying a day trip to the Lake from those who do not. The former "unconstrained" category describes individuals whose labor/leisure choice is at an "interior" and whose opportunity cost of time is reflected in the wage rate. In our demand function, the opportunity cost of time of the latter "constrained" category is reflected in the absolute value of the coefficient of the travel time variable in Tables 3 and 4. Unconstrained individuals' opportunity cost of time was based on empirical evidence presented by Cesario (1976) where the most common assumption is that the price of time spent travelling can be valued at between a ¼ and ½ of the wage rate. Our choice was a third of the wage rate and the choice of yearly hours worked is based on the responses and results presented in the April 2009 Government of Pakistan Time Use Survey. The constrained individuals' time was set at zero. When this structure of modeling is not followed, and all individuals in our sample are treated equally for time valuation, the estimated mean consumer surplus per visit is PKR 27,322 (or USD 329). Compared to the welfare measure using $^{1}/_{3}^{rd}$ the wage rate, which amounts to PKR 31,694 (or USD 381), the access value of Keenjhar is underestimated to the order of 16 per cent.

In Table 4, we include four additional variables, namely, education (the number of years of schooling), unemployed (reporting the employment status of visitors in 2009), willingness to pay an increased entrance fee of PKR 50 (destined solely for cleanliness and upkeep costs), and ages of respondents. The 7-variable regression is focused on the determinants of visitation relating to the ability of individuals to travel unaccompanied, the ease with which their travel decisions are undertaken, and their preferences for water-based activities. The 11-variable regression extends this coverage by touching on discretionary time as reflected in people's employment status as well as socioeconomic characteristics such as education and age. Our hypothesis as regards willingness to pay is that the agreement to pay increased fees would enhance visits.

As shown in Table 5, the estimated mean consumer surplus per visit in the endogenous stratified truncated Poisson is PKR 9,024 (or USD 109) (based on Model 3 in Table 4). This estimate is only marginally smaller (a 5 per cent difference) when compared to the result obtained from our 7- variable endogenous stratified truncated Poisson regression (USD 116). In this case too, there is an overestimate of the sample mean willingness to pay by just under 5 per cent when the on-site nature of the sample is not considered. A comparison of the results with Tables 3 and 4 suggests many similarities. For instance, the coefficient of income continues to be statistically insignificant. We therefore comment only on the overall important differences. In relation to the income coefficients, the 11-variable regression produces no significance in all three models. One reason for this may be the inclusion of additional variables that do not have significant explanatory power and render the income variable less efficient.

6.3 Impact of Outset Origins on Welfare Measurement

A design feature in our questionnaire permitted the analysis of impacts on welfare measurement arising from differences among visitors in terms of their point of departure. In particular, respondents travelling as a large group in rented buses/vans (437 visitors or 59 per cent of our sample of 741) were asked if they incurred petrol and time costs before boarding their charter transport. In other words, we did not assume that all members of an extended family or all members of a group of friends were picked up from their front door. We refer in Table 5 to a "common point of departure" (CPD) to describe the point of boarding chartered transport for those who were not picked up from their home (which is 47 out a total of 741 respondents or 6 per cent of our sample). The term "home" indicates that welfare was calculated on the assumption that all chartered transport visitors were picked up from their doorstep. We assume "CPD" and "home" are the embarkation points for each of the two sub-samples that are used to estimate consumer surplus in Table 5. The impact on consumer surplus, an increase of 41 per cent, is pronounced when the sub-sample is restricted to only those who reported costs before boarding their chartered transport.

An important caveat is that the selection of our sub-samples is motivated by an effort to elucidate the disproportionate effect that the travel cost variable construction can have on access value measurement. It neither reflects an extension in the study's overall survey design, nor intends to develop any inference requiring a discussion of the extent to which survey design accuracy has been eroded. Further, with regard to the direction of change in consumer surplus, we could say that it has increased in our case following a decrease in the travel cost coefficient due to a flattening of the trip generating function as the travel cost increased more for individuals with a low travel cost than for individuals with a high travel cost. Again, this is an insignificant result for the purposes of upward aggregation.

However, our analysis does show that the unrealistic and simplifying assumption that this category of visitor does not incur travel and time costs before boarding charter transport results in a significant underestimate of consumer surplus values. While our design feature can be cumbersome and cause respondent fatigue, it has the potential for replicability and improvement where travel from urban centers to recreational resorts using shared transport is common. Moreover, in a review of revealed preference valuation techniques, Bockstael and McConnell (2007) found that cost coefficients tend to figure prominently in welfare measurement irrespective of the functional form. With reference to the zonal travel cost method, Bateman *et al.* (1997) undertook research on embarkation points for the trip focusing in their case on the accuracy of road distances and routing to recreational sites and the impact that this has on welfare measurement. This study was based on a sample of 351 visitors to a woodland recreation site. The authors use actual road network distance in order to compare the consumer surplus estimates derived using it with those obtained by assuming straight line travel, where they found the latter to underestimate welfare values up to 20 per cent. The revision of data collection and processing strategies in our case is all the more important given the fact that chartered transport of the kind used by Karachiites is common in the urban centers of developing countries. For example, in an application of the travel cost method in Bangladesh, Shammin (1999) found as many as 58 per cent of visitors to the Dhaka zoo to use a bus as compared with 20 per cent in the tempo/scooter category. The easy availability of buses, microbuses and other shared/chartered transport for low income groups visiting popular public attractions is also underlined in Mahat and Koirala (2006), which applies the travel cost method to study visitors to the Jawalakhel Central Zoo of Nepal where this category represented 80 per cent of all transport modes.

7. Conclusions and Policy Implications

Our study applies the TCM to Keenjhar Lake in order to provide information on its recreational use value. We estimate this value to be PKR 3.46 billion (or USD 42.2 million). This estimate is based on an annualized mean consumer surplus per visit of PKR 9,500 (or USD 116) and assumes average daily visits of 1,000. Changing the model specification reduces consumer surplus only by about 5%.

Past estimates of direct consumptive use of Keenjhar Lake besides tourism may be arithmetically summed to our finding to produce an even larger direct use value for Keenjhar.[7] Any such augmented direct use value estimate may not be applicable in a benefit cost analysis in the context of Keenjhar since it already enjoys protected status as a Ramsar site. However, we expect the exercise to be useful for its replicability within the Indus Ecoregion and elsewhere in Pakistan. A good policy platform for this purpose is the WWF-P's Indus for All Programme (www.foreverindus.org). Although still in the first phase of its 50-year strategy (2006-2012), WWF-P's Indus for All Programme has, in this relatively short period, established a transactional space for the refinement of Pakistan's policy framework, development strategies, and the alignment of multiple stakeholder interventions as they relate to the Indus Ecoregion.

[7] One direct use value for Keenjhar has already been estimated and is a net present value of PKR 3.16 billion (or USD 50.9 million) at the discount rate of 10 per cent, when adjusted for inflation, and relates to a producer surplus for commercial fisheries at the Lake (Dehlavi *et al.,* 2008). Notwithstanding the evident depreciation of the PKR from 2008-2009, the recreational direct use value is significantly higher (by about 10 per cent) than the direct use value from fishing. This finding is in line with findings for the Botswana wetlands covered in our literature review. The 10 per cent discount rate used corresponds to the average yield of the 6 month T-Bill for the past 15-20 years (about 10 per cent between March 1991 and April 2009). This is a conservative benchmark for the time value of money in Pakistan. Pakistan Investment Bonds are probably a better instrument to obtain average yields for this purpose but there is regrettably no data available until 2001.

Since our database allows for easy addition of more data, it should serve as an ongoing tool for not only researchers but also for the STDC in order to analyze the demand for accommodation and choice of activities on its reserves. In this regard, the database can be used to estimate the impact of price increases on consumer surplus. However, such an exercise should be conducted with care so as to address equity issues. This is particularly necessary due to the circulation of a request for proposals in February 2009 by the Public Private Partnership Unit, Finance Department, Government of Sindh, for the purpose of constructing hotels, restaurants, theme parks, lagoon pools, and spas at Keenjhar Lake. While there is much to be said in favor of developing the recreational uses of Keenjhar Lake given the high consumer surplus, as demonstrated in our study, there is also a need to do so without compromising its status as a nature reserve and as a site making its facilities available to a cross-section of the population regardless of wealth and other socio-economic status.

Acknowledgements

The paper was funded by SANDEE and hosted by WWF-P. We wish to thank the Board members, fellows, advisors, referees, grantees and the staff of SANDEE for providing intellectual support for this work. We are especially thankful to Jeffrey Vincent for supervising the work from start to end. A number of people gave helpful comments on the methodology and questionnaires. They include Enamul Haque, Priya Shyamsundar, M.N. Murty, Subhrendu Pattanayek, E. Somanathan, Mani Nepal, Santadas Ghosh, Dilhani Marawila, Manoj Thibbotuwawa, Jean-Marie Baland, Bishnu Prasad Sharma, Ghulam Akbar, Tehmina Mangan, Pranab Mukhopadhyay, Safiya Aftab, Amna Shahab, Hussain Tawawallah, Rab Nawaz, Sajid-Ullah Jan, Maliha Dehlavi, Ben Groom, Khadija Zaheer, Meherunissa Hamid, Rehana Siddiqui, and Willem van den Andel. We thank them all. We are grateful to Carmen Wickramagamage for her valuable editorial suggestions and changes.

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Tables

Table 1: Explanatory Variables and Associated Hypotheses

Variables	+/-	Definition & Hypothesis	Mean	Std. Dev.	Min	Max
Travel Cost (TC)	-	Out-of-pocket and travel time costs that exclude opportunity cost of time of visitors able to trade available recreation time with work time (H_A : travel cost is inversely related to the number of visits)	1,283	1,162.3	0	1,6078
Travel Time (Ti)	-	Two-way travel time of "constrained" individuals only (H_A : as travel time increases, fewer visits will be undertaken).	174.05	90.83	3	900
Household Income (mon_income)	+	Annual income of households (H_A : an income rise is accompanied by increased visitation).	43,000	74,343.36	2,000	1,000,000
Education (education)	+	Years of schooling of respondents	11.85	3.58	0	21
Age (age)	-	Age in years of respondents (H_A : Age to be inversely related to visits)	31.66	9.97	12	73
Distance (distance)	-	One way distance to Keenjhar	49.57	79.84	28	487
Interacted_TC	?	Here the dummy for multiple purpose visits (see d_mp below) is being multiplied by the travel cost variable. (H_A : if the interacted TC coefficient is significant then multiple sites have an effect on the price slope of the demand curve, i.e., the slope is different for the two trip reason groups: primary vs. multiple purpose visits)	568.29	969.97	0	8212
Interacted_Travel_Time	?	Here the dummy for multiple purpose visits (see d_mp below) is being multiplied by the travel time variable. (H_A : omission of an interaction between the dummy for multiple purpose visits with travel time would bias the travel cost coefficient. This variable has no specific interpretation unlike the "Interacted Travel Cost" variable)	1.65	2.95	0	30
Variable	+/-	Hypothesis	Description	Frequency	%	Cum.%
Gender (gender)	+	1 if males, 0 otherwise (H_A : males face fewer travel constraints)	Male	732	98.79	98.79
			Female	9	1.21	100
Marital Status (married)	-	1 if married, 0 otherwise (H_A : single males face fewer obligations when making a travel decision).	Single	322	43.45	43.45
			Married	419	56.55	100
Residence (urban)	-	1 if rural (H_A : rural visitors are less likely to visit)	Rural	114	15.38	15.38
			Urban	627	84.62	100
Water-based Activities (waterac_pref)	+	1 if respondent prefers activities that require direct contact with water (e.g., rubber tube rental, wading, or, swimming), 0 otherwise (H_A : visitors with such a preference are likelier to visit the lake)	Yes	676	91.85	91.85
			No	60	8.15	100
Multiple Purpose Visits (d_mp)		1 if respondent undertook incidental side trips for other purposes, 0 otherwise	Yes	309	41.7	41.7
			No	432	58.3	100
Unemployed (unemp_09)	?	1 if employed in 2009 (No sure as regards the expected sign of the coefficient)	Yes	567	76.52	76.52
			No	174	23.48	100
Increased Entrance Fee (wtp_50)	+	1 if respondents agreed to pay the hypothesized increase in entry fee of PKR 50 (H_0 : agreeing to pay would enhance visits)	Yes	533	71.93	71.93
			No	208	28.07	100

Source: Survey (12-18 August 2009); the sample size is 741

Table 2: Estimator Selection for the Travel Cost Model

	Endogenous Stratified and Truncated Poisson		**Endogenous Stratified Negative Binomial**	
	1	**2**	**3**	**4**
Variables	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)
Constant	-0.195*** (0.053)	0.373*** (0.065)	-14.347 (196.956)	-12.988 (93.716)
Travel Cost	-0.00005* (0.00003)	-0.00006** (0.00004)	-0.00005 (0.00005)	-0.00005 (0.00005)
Monthly Income	1.09e-08 (5.13e-07)	7.58e-08 (5.09e-07)	-3.62e-08 (7.45e-07)	-8.29e-09 (7.46e-07)
Travel Time		-0.048*** (0.0106)		-0.051*** (0.016)
LR / Wald χ^2	2.41	24.12	1.16	11.84
Level of sig.	0.2998	0.0000	0.5601	0.0080
Pseudo R^2	0.0010	0.0096		
Ⱥ			2069827 (4.08e+08)	637830.7 (5.98e+07)

Note: ***, ** and * indicate significance at the 1% , 5% and 10% levels respectively. Results are for a sample size of 741.

Table 3: Endogenous Stratified and Truncated Poisson Regression- Basic Models

	1	**2**	**3**
Variables	**Estimate (S.E.)**	**Estimate (S.E.)**	**Estimate (S.E.)**
Constant	-1.192 (0.728)	-1.288* (0.729)	-1.218* (0.729)
Travel Cost	-0.00006** (0.00003)	-0.00007** (0.00004)	-0.0001** (0.00004)
Travel Time	-0.052*** (0.011)	-0.053*** (0.011)	-0.080*** (0.015)
Monthly Income	2.17e-07 (5.06e-07)	2.91e-07 (5.11e-07)	3.19e-07 (5.13e-07)
Gender	1.696** (0.709)	1.719** (0.709)	1.783** (0.710)
Married	0.231*** (0.072)	-0.216*** (0.072)	-0.218*** (0.072)
Urban	0.299*** (0.088)	-0.301*** (0.088)	-0.304*** (0.088)
Waterac_pref	0.255* (0.139)	0.234* (0.139)	0.220 (0.139)
D_mp		0.225*** (0.070)	-0.048 (0.132)
Interacted_TC			0.00007 (0.00007)
Interacted_Travel_Time			0.058*** (0.022)
LR (χ2)	58.19	68.5	76.43
Level of sig	0.0000	0.0000	0.0000
Pseudo R^2	0.0233	0.0274	0.0306

Note: Note: ***, ** and * indicate significance at the 1 per cent, 5% and 10% levels respectively. Results are for a sample size of 741.

Table 4: Endogenous Stratified and Truncated Poisson Regression - Extended Models

	1	2	3
Variables	**Estimate (S.E.)**	**Estimate (S.E.)**	**Estimate (S.E.)**
Constant	-1.299* (0.751)	-1.424* (0.752)	-1.352* (0.753)
Travel Cost	-0.00007** (0.00003)	-0.00007** (0.00004)	-0.0001*** (0.00005)
Travel Time	-0.051*** (0.011)	-0.052*** (0.011)	-0.079*** (0.016)
Monthly Income	1.72e-07 (5.22e-07)	2.31e-07 (5.29e-07)	2.65e-07 (5.32e-07)
Gender	1.699** (0.710)	1.725** (0.711)	1.777** (0.711)
Married	-0.254*** (0.085)	-0.241*** (0.084)	-0.239*** (0.085)
Urban	-0.296*** (0.089)	-0.310*** (0.089)	-0.304*** (0.089)
Waterac_pref	0.254* (0.139)	0.234* (0.139)	0.221 (0.139)
Education	0.004 (0.010)	0.006 (0.010)	0.007 (0.010)
Unemp_09	0.061 (0.089)	0.073 (0.089)	0.050 (0.090)
Wtp_50	0.080 (0.080)	0.083 (0.079)	0.094 (0.080)
Age	-0.0005 (0.004)	-0.0004 (0.004)	-0.0005 (0.004)
D_mp		0.231*** (0.071)	-0.047 (0.133)
Interacted_TC			0.00007 (0.00007)
Interacted_Travel_Time			0.058*** (0.022)
LR $\chi 2$	60.10	71.00	78.95
Level of Sig.	0.0000	0.0000	0.0000
Pseudo R^2	0.0240	0.0284	0.0316

Note: ***, ** and * indicate significance at the 1% , 5% and 10% levels respectively. Results are for a sample size of 741

Table 5: Results of Recreational Values for Different Specification of Time Cost and Out of Pocket Expenses in the Travel Cost Variable

Sample Used	Outset Origin	TC Coefficient	Standard Error	t- Value	Log Likelihood	Prob > chi2	Consumer Surplus (mean per visit, USD)
47 charter transport users who were not picked up from home (6 per cent of the sample)	CPD	-0.0001891	0.0003738	-0.51	-47.231313	0.1205	64
	Home	-0.0002658	0.0003727	-0.71	-47.102377	0.1059	45
Entire sub-sample of 437 charter transport visitors (59 per cent of the sample)	CPD	-0.0002814	0.0001	-2.81	-699.21066	0.0171	43
	Home	-0.0002958	0.0000995	-2.97	-698.74401	0.0107	41
Full sample (741 visitors)*	Home	-0.0001108	0.0000506	-2.19	-1211.2103	0.0000	109
Full sample (741 visitors)**	Home	-0.0001051	0.0000497	-2.11	-1212.4745	0.0000	115

Note: The term "home" indicates that welfare was calculated assuming that all chartered transport visitors were picked up from their doorstep; conversely, the welfare measurement incorporating time and out-of-pocket expenses incurred before boarding chartered transport is denoted by "common point of departure" (CPD).

* Results relate to Model 3 in Table 4. ** Results relate to Model 3 in Table 3.

Table 6: Sampling Plan

Sampling Plan: Zones A & B (Revised to include Saturday)																
Zone A & B		**Swiming**	**Rub tubes**	**Boats**	**Play rides**	**Jhompris**	**Cottages**	**Restaurant**	**Ventors**	**Car wash**	**Total**	**Karachi**	**Thatta**	**Hyderaad**	**other 10 Districts**	**Total**
Saturday	730-1030	49	10	12	0	2	0	0	2	0	76	45	11	8	12	76
	1030-1330	22	5	30	6	3	0	0	8	2	77	46	11	8	12	77
	1330-1630	19	11	11	1	4	0	3	2	1	53	32	7	5	8	53
	1630-1930	19	12	24	4	3	0	13	13	1	88	53	12	9	14	88
Sunday	730-1030	49	10	12	0	2	0	0	2	0	76	45	11	8	12	76
	1030-1330	22	5	30	6	3	0	0	8	2	77	46	11	8	12	77
	1330-1630	19	11	11	1	4	0	3	2	1	53	32	7	5	8	53
	1630-1930	19	12	24	4	3	0	13	13	1	88	53	12	9	14	88
Monday	730-1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1030-1330	8	4	24	14	1	0	0	1	2	54	32	7	5	9	54
	1330-1630	10	3	7	3	2	0	3	1	1	29	18	4	3	5	29
	1630-1930	4	6	8	1	0	0	1	3	1	23	14	3	2	4	23
Tuesday	730-1030	0	1	6	4	0	0	0	1	0	12	7	2	1	2	12
	1030-1330	0	0	7	0	0	0	0	4	0	12	7	2	1	2	12
	1330-1630	0	2	0	2	0	0	0	1	1	6	4	1	1	1	6
	1630-1930	0	0	1	0	0	0	0	0	0	2	1	0	0	0	2
Wednesday	730-1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1030-1330	0	3	2	17	1	0	0	0	0	23	14	3	2	4	23
	1330-1630	1	4	13	11	1	0	1	2	0	33	20	5	3	5	33
	1630-1930	1	1	8	0	0	0	1	1	0	11	7	2	1	2	11
Thursday	730-1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1030-1330	0	2	9	18	0	0	0	4	1	35	21	5	4	6	35
	1330-1630	2	4	19	2	0	0	1	3	0	32	19	4	3	5	32
	1630-1930	0	2	1	2	0	0	0	2	1	7	4	1	1	1	7
Friday	730-1030	1	18	15	14	1	0	0	1	1	51	31	7	5	8	51
	1030-1330	0	2	6	23	1	0	0	1	1	34	21	5	3	5	34
	1330-1630	1	2	11	6	1	0	0	3	1	24	15	3	2	4	24
	1630-1930	0	2	5	14	0	0	1	1	1	25	15	3	2	4	25
Total		**246**	**133**	**295**	**154**	**30**	**2**	**38**	**81**	**21**	**1000**	**600**	**140**	**100**	**160**	**1000**

Figure 1: Visitation by District (28.2.09 – 6.3.09)

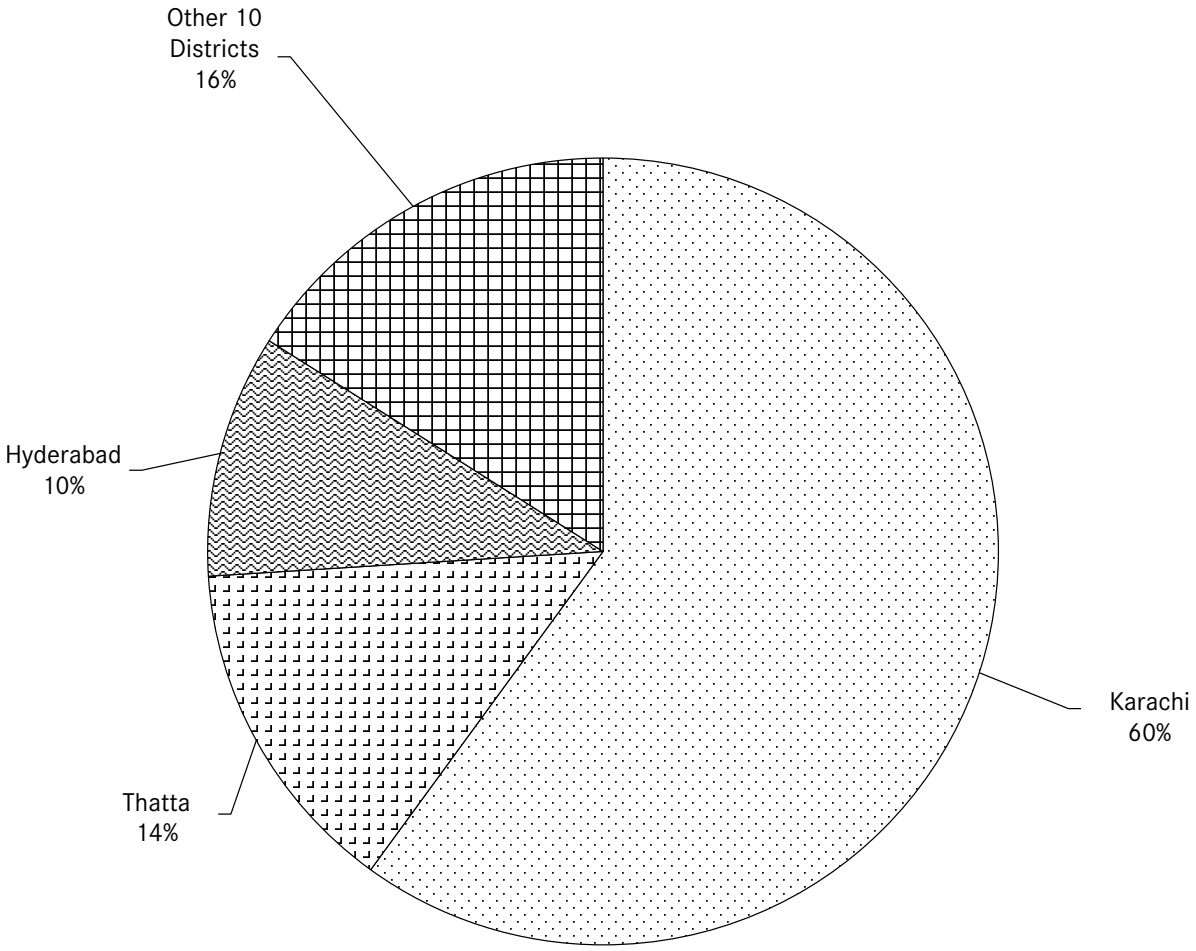
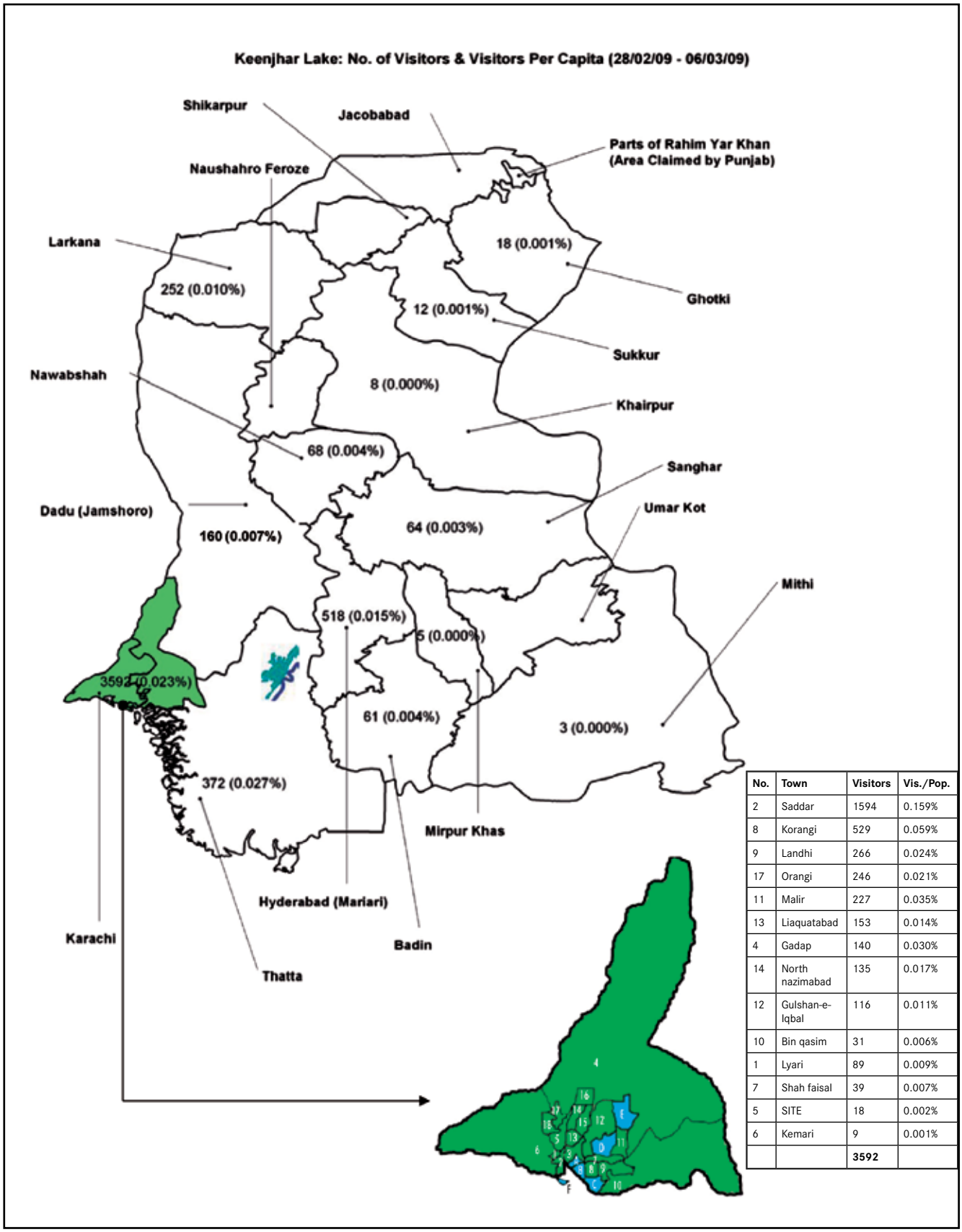


Figure 2: Numbers of Visitors & Visitors per Capita (28.2.09 – 6.3.09)



No.	Town	Visitors	Vis./Pop.
2	Saddar	1594	0.159%
8	Korangi	529	0.059%
9	Landhi	266	0.024%
17	Orangi	246	0.021%
11	Malir	227	0.035%
13	Liaquatabad	153	0.014%
4	Gadap	140	0.030%
14	North nazimabad	135	0.017%
12	Gulshan-e-Iqbal	116	0.011%
10	Bin qasim	31	0.006%
1	Lyari	89	0.009%
7	Shah faisal	39	0.007%
5	SITE	18	0.002%
6	Kemari	9	0.001%
		3592	

Annex 1: Survey Instrument

Questionnaire No. |__|__|__|__|

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Shahra-e-Faisal, PECHS Block 6,
Karachi 75400, Pakistan
Tel. 92-21-4544791-2 / Fax 4544790

PO Box 8975 EPC – 1056
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Tel. 977-1-552 8761
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VALUING the RECREATIONAL USE OF PAKISTAN'S WETLANDS:

APPLICATION OF the TRAVEL COST METHOD to Keenjhar Lake

World Wide Fund for Nature – Pakistan (WWF-P)
South Asian Network for Development and Environmental Economics (SANDEE)
Joint WWF-P and SANDEE Project (2009-2010)*

MAIN SURVEY (12-18 August 2009)
KEENJHAR LAKE, THATTA DISTRICT

DEFINITION OF ZONES

Zone A (Paid activities: jhompris, cottages, tents, boats, restaurant, vendors, swimming costumes) (Unpaid activities: children's rides)

Zone B (Paid activities: jhompris, boats, rubber tubes, vendors, car wash) (Unpaid activities: swimming, wading, own car wash)

* Information collected for this questionnaire will be used exclusively for the WWF-P SANDEE project during 2009-2010. The confidentiality of the information supplied is assured.

Date of interview:

1st DAY / /	2nd DAY: / /	3rd DAY: / /
4th DAY / /	5th DAY: / /	6th DAY: / /
7th DAY / /		

Interviewer's name : _____

Supervisor's name : _____

Checked by : _____
(Checker's Name & Signature)

Edited by : _____
(Editor's Name & Signature)

Tourists alone should be interviewed (excluding foreign nationals), both those who are day trippers and holiday makers (i.e., who are availing themselves of STDC cottages). Information should be collected once tourists have completed their day's activities and are setting out to leave Keenjhar to return home. Not more than one respondent from a single party should be interviewed (N.B. shared transport may be used by several parties, also the party itself may be composed of friends or colleagues, a single or multiple families, or some other composition).

Enumerators must remember to count the total number of non-responses each day and enter the number in the space provided in the enumerators' manual. Non-responses include those who refused to be interviewed in addition to those who stopped part way through their interview for any reason (reasons must be noted).

Complete Address:_____

Mobile Number:_____

Name of Respondent with Father's/Spouse's Name:_____

For Day-trippers: Time of arrival:_____ Estimated time of departure_____

For Holiday-makers (on-site only): Date of arrival:_____ Planned date of departure _____

For Holiday-makers (Long trip in which Keenjhar made up day(s) only):No. days making up full journey: _____ ;
Average per day spending (considering past and expected upcoming per day expenses) _____

Table A16: Multiple Destination Trips & Past Visitation Trends

Multiple Destination Trips										**Past Visitation Trend**							
Sites visited en route to Keenjhar 1. Yes 2. No		List sites visited *1 (if yes in previous column)		If site closed, would not visit Keenjhar 1. yes 2. no (if yes, circle the relevant site)		If Keenjhar not visited today, I would instead have spent the day at__ *2		Travel Time one-way to location named (min.)		Distance one-way to location named (Km.)		First visit to Keenjhar 1. Yes 2. No		No. of visits to Keenjhar in past 2 months (June-July 2009)		No. of visits to Keenjhar in past year (June 2008-June 2009)		Total ever no. of visits to Keenjhar	
A16a		A16b		A16c		A16d		A16e		A16f		A16g		A16h		A16i		A16j	

*1. List sites visited: list name(s) (insert bracket and include on-site time & on-site expense incurred): [1]_____; [2]_____ ;
[3]_____ [4]_____ ; [5]_____;
*2 Instead of Keenjhar: please name (recreational) activity & its location _____

Table C1: Improvement to Site

Rate Site Quality *1		Satisfied with Recreational Experience 1.Yes 2. No		Most Valued Attributes *2		Improved Facilities Desired 1.Yes 2. No		If No, Reasons *3		If Yes, Type of Improvements Desired *4		Suggested Mode of Payment for Improvements *5		Willing to Pay Entrance Fee, If No Other Financing Mode Available 1.Yes 2. No		Would pay if no new development offered, but upkeep of cleanliness covered by new entrance fee of Rs. 50 1. yes 2. no		In favor of planned modern recreational development at Keenjhar, including spas, hotels, theme parks 1.Yes 2. No	
C1a		C1b		C1c		C1d		C1e		C1f		C1g		C1h		C1i		C1j	

*1 Rate Site Quality: [1] very poor; [2] poor; [3] fair; [4] good; [5] very good; * 2 Most Valued Attributes: (please rank up to three): [1] lake; [2] scenery; [3] birds; [4] boating; [5] outing away from urban setting; [6] facilities such as play rides and accommodation; [7] relaxation; [8] any other_____; *3 Improved Facilities Not Required Because: [1] satisfied with existing facilities; [2] Other_____; *4 Most Desired Improvements: (please rank up to three) [1] waste disposal; [2] refurbished or upgraded accommodation; [3] lavatory; [4] changing facilities for swimming; [5] heightened safety measures for swimming and boating; [6] reduced congestion through peak visitation management; [7] restriction on vehicle washing; [8] any other_____; *5 Suggested Mode of Payment: [1] raise entry fee; [2] charge a vehicle parking fee; [3] government financing; [4] private donation; [5] other_____;

Section B: Avrting Behavior and Site Quality

Table B1: Averting Behavior and Site Quality

Preferred activities include wading / swimming and rubber tube rental	Chose to limit visits in any period(s) over course of any given year	Reason for limiting visits (if yes in previous column)	Chose not to visit in any period(s) over course of any given year	Reason for not visiting (if yes in previous column)	Chose to limit activities in any period(s) over course of any given year	Reason for limiting activity (if yes in previous column)	Chose to limit activities today	Reason for limiting activity (if yes in previous column)	Chose to restrict these activities in June-July			Water quality appeared different in June-July compared to rest of year
									Boating	Swimming/ wading	Rubber tube rental	
	*1	*2	*3	*4	*5	*6		*7	*8	*9	*10	*11
1. Yes 2. No	1. Yes 2. No		1. Yes 2. No		1. Yes 2. No		1. Yes 2. No		1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
B1a	B1b	B1c	B1d	B1e	B1f	B1g	B1h	B1i	B1j	B1k	B1l	B1m

*1 Limit Visits: which period? _____ (name month or months); *2 Reason for Limiting Visits: ____ (see List A below);*3 No Visits: which period? _____ (name month or months); *4Reason for Not Visiting: ____ (see List A below); *5 Limited Activities: which period? _____ (name month or months); *6 Reason for Limiting Activity: ____ (see List A below); *7 Reason for Limiting Activity Today: ____ (see List A below); *8 How Boating Was Affected: [1] reduced no. of trips taken; [2] took no trips; [3] switched to non-water related activity; [4] switched to other water-related activity; [5] other_____ and reason for limiting in June-July:_____ (see list B below); *9 How Swimming Was Affected: follow procedure in note 7 & reason___ (see List B below); *10 How Rubber Tube Use Affected: follow procedure in note 7 & reason___ (see List B below); *11 Quality Different How: [1] more transparent; [2] less transparent; [3] other_____

List A (for columns c, e, g):
[A] don't know; [B] hot weather; [C] cold weather; [D] clashed with school, work, or other schedule; [E] site too crowded; [1] garbage; [2] washing of cars/trucks/diggers; [3] discoloration of water; [4] film/coating on surface of water; [5] floating weeds / floating growth from eutriphication; [6] odor from fishing nets; [7] odor from weeds/eutriphication; [8] odor from stagnant water; [9] unnatural / sticky substance on bottom of feet after wading or swimming; [10] dead fish or other dead animals in water or on land; [11] human / animal feces; [12] detergents used for bathing and washing clothes; [13] Other 1_____; [14] Other 2_____; [15] Other 3_____; (remember "other" may be needed for columns c, e, g, h, I, j, etc. and should be clearly linked to the relevant column).

List B (for columns h, i, j):
[G] don't know; [H] unable to swim; [I] scared of water; [J] too crowded; [K] religious or cultural reasons (e.g., swim wear is inappropriate); [L] inadequate STDC changing and washing facilities; [M] inadequate STDC safety facilities; thereafter, read from [1] onwards (above).

Section A: Access Value Measurement and Activity Choice Modules

A1. Did visiting party enter through Gate A or B?_____ (Mark "A" or "B")

Table A12: Livelihood Source & Other Characteristics of Individual

Age (years)	Gender 1. Male 2. Female	Marital Status	Education Status (yrs. of schooling)	Primary Occupation	Religion	Employed in 2009 1. Yes 2. No	Sponsored visit 1. Yes 2. No	Salary of Respondent in 2009 (Rs/month)	Aggregate household earnings in 2009 (Rs/month)	Aggregate household expenditure in 2009 (Rs/month)	No. of sick leave & paid vacations availed up to end-June 2009	Swimming proficiency
		*1		*2	*3			*4	*5	*6		*7
A12a	A12b	A12c	A12d	A12e	A12f	A12g	A12h	A12i	A12j	A12k	A12l	A12m

*1 Marital status: [1] single; [2] married; [3] divorced/widowed/separated; * 2 Primary occupation: [1] student; [2] salaried employee (permanent); [3] salaried employee (casual); [4] self-employed (own manufacturing/trading enterprise); [5] agriculture / fishery; [6] homemaker; [7] retired; [8] any other_____; *3 Religion: [1] Muslim; [2] Christian; [3] Hindu; [4] Other; *4 if Hourly Wage: rate_____ , average no. of hours a day_____ , average no. days a week_____ & no. months a year to exclude_____; *5 Aggregate Household Earnings include respondents' own wages/salary and any supplementary earnings, e.g., interest from bonds; *6 Aggregate Expenditure: no. of earning adults in your household:___ (≤12 to ≥65); no. of children in your household:___ (≤12); *7 Swimming Proficiency: [1] wading / floating, [2] swimming proper; [3] cannot swim

Table A12: Livelihood Source & Other Characteristics of Individual

Composition of Visiting Party (Nos.) *1								**No. Dependents within Total Party *2**	**Resident of Area that is** 1. Yes 2. No	**Point of Origin *3**		**Mode of Trabsport *4**	**Travel Time one-way (in.) *5**	**Distance one-way (km) *6**
Adults (≤12 to≥65)		Juveniles (≤12)		Pensioners (≥65)		Total				District (write full name)	Village/ Town (Write full name)			
Male	Female	Male	Female	Male	Female									
A13a	A13b	A13c	A13d	A13e	A13f	A13g		A13h	A13i	A13j	A13k	A13l	A13m	A13n

*1 Composition of Visiting Party: a count is required here of the family, friends, colleagues or other members forming a sub-group within a (convoy of) vehicle(s) that may also carry parties besides the sub-group; *1 No. of "Dependents" from Total Party: "dependents" are defined as family members whose costs are borne by the respondent; *3 Point of Origin: in the case of "shared (rented/public) vehicles" this refers to the "common point of departure"; in the case of "privately owned (leased) vehicles" transport, this refers to home or starting point of journey);*4 Mode of Transport: [1] Motorbike; [2] Car; [3] Hiace; [4] Coach; [5] Bus; [6] Bicycle; [7] Walking; [8] Other_____; (in the case of "shared (rented/public) vehicles" this refers to the mode of transport used from the "common point of departure" onwards); *5 Travel Time: in the case of "shared (rented/public) vehicles" this refers to the "common point of departure"; *6 Distance: in the case of "shared (rented/public) vehicles" this refers to the "common point of departure".

Table A14: Travel Cost

(a) In Case of Privately Owned (leased) Vehicle

No. of Owned Cars Brought to Lake *1	Fuel Type *2	Fuel Cost (one way) (Rs.) *3	Toll Fee (Rs.) *4	Entrance Fee (vehicle) (Rs.) *5	Entrance Fee (Individual) (Rs.) *6	Fixed Ownership Cost of Vehicle							
						If Obtained through Loan/Finance				If Purchased Total Cost (Rs.)	Make & Model of Vehicle * 7	Year of Release of Vehicle * 8	Year of Purchase * 9
						Down Payment (Rs.)	Monthly Installment (Rs.)	Number of Installments	Total Cost (Rs.)				
A14aa	A14ab	A14ac	A14ad	A14ae	A14af	A14ag	A14ah	A14ai	A14aj	A14ak	A14al	A14am	A14am

*1 No. of Owned Cars Brought to Lake: if multiple, no. from total whose costs are being borne by respondent:_____; *2 Fuel Type: [1] CNG;[2]Diesel;[3]Petrol; * 3 Fuel Cost: this refers to money spent from the point of departure; *4 Toll Fee: this refers to the sum of all tolls / taxes (excluding police fine if any) at different places from point of departure to Keenjhar; *5 Entrance Fee: this refers to the fixed entrance fee charged by the STDC for different types of vehicles at two main entrance gates. (Rates in Rupees are: i) bus - 20; ii) coach and Hiace – 15; iii) car-10; iv) motorcycle - 5); *6 Entrance Fee (individual): this refers to the fixed entrance fee (Rates in Rupees are: i) adults - 5; ii) students - 2; iii) children from 5 yrs to 12 yrs and army personnel - 2); *7 Make and Model of Vehicle: this refers to the 'company name', e.g., Suzuki, and the model/name of the vehicle, e.g., Alto, please note here:_____; *8 Year of Release: this refers to the manufacturing date of the vehicle; please note here:_____; *9 Year of Purchase: this refers to the year when this particular make and model was purchased by the owner; please note here:_____.

(b) In Case of Shared (public/rented) Vehicle [individual, Individual with dependents, and sub-groups]

From Home to Common Point of Departure				**From Common Point of Departure to Keenjhar**			**Average Cost Incurred from Common Point (excl. other sites visited) *4**				
Transport Mode *1	Cost of Transport (one-way) (Rs.) *2	Travel Time (one-way) (min.)	Distance (one-way) (Km.)	Total no. of Passengers in Vehicle (Estimated no.)	Agreed Cost (per head) for Transporting All Passengers (two-way) (Rs.) *3	Cost to Individual (inclusive of dependents, if any) (Rs.)	Fuel Cost (two-way) (Rs.)	Toll Fee (Rs.)	Entrance Fee (vehicle) (Rs.)	Entrance Fee (individual) (Rs.)	Others (Rs.)
A14ba	A14bb	A14bc	A14bd	A14be	A14bf	A14bg	A14bh	A14bi	A14bj	A14bk	A14bl

*1 Transport Mode: [1] taxi; [2] rickshaw; [3] public transport; [4] car; [5] motorcycle; [6] bicycle; [7] on foot; [8] other_____; * 2 Cost of Transport: if sharing total cost of group, this refers to individual's cost only (must include cost of covering dependents); *3 Agreed Cost for Transporting All Passengers: this is the full amount that covers all passengers – it must include vehicle rental, toll fee, food, petrol, etc. – in so doing, the figure groups cost items that the tour operator may have offered separately (e.g., petrol is sometimes not covered by tour operator); *4 Items [Items here are a disaggregation of column f (or column g, as the case may be).

(c) For Both Classes (owning or sharing vehicles)

Costs Incurred during Journey (incidental, incl. visits to other sites)				Employed in 2008 1. Yes 2. No	**Separately Binding or Single Constraint for Time and Budget constraints (opportunity cost of Time)**							
Total Expenses from Visiting Other Site(s) (Rs.)	Repair of Vehicle (Rs.)	Fine (Rs.)	Others (Rs.) *1		No. Hours Worked on Average per Week in 2008*	No. Paid Vacations and Sick Leave Days Availed in 2008	No. Hours Worked on Average per Week in 2009*	No. Paid Vacations and Sick Leave Days Availed in 2009	Number of Off Days in the Week	For the Typical 2008/09 Keenjhar Trip, Would You Have Been Working Instead 1. Yes 2. No	Payment Received for That Work Time (if yes in previous column) 1. Yes 2. No	Expected Hourly Rate (if yes in previous column) (Rs.)
A14ca	A14cb	A14cc	A14cd	A14ce	A14cf	A14cg	A14ch	A14ci	A14cj	AA14ck	A14cl	A14cm

*No. Hours Worked on average per Week: include vacation and sick leave time; *1 Others: please specify items_____

Table A15: On-site Expenses

(a) On-site Expense (Accommodation)

Expense on Cottage						**Expense on Jhompri**					
Rate per Day (Rs.) (Also: circle one: luxury, standard)	No. of Days	Total Cost (incl. many days, more than one cottage, advance pay, etc.) (Rs.)	If Expense Shared 1. Yes 2. No	No. of Persons Who Shared Total Cost	Share of the Total Cost (inclusive of dependents, if any) (Rs.)	Rate per Hour (Rs.)	No. of Hours (Hrs.)	Total Cost (Rs.)	If Expense Shared 1. Yes 2. No	No. of Persons Who Shared Total Cost	Share of the Total Cost (inclusive of dependents, if any) (Rs.)
A15aa	A15ab	A15ac	A15ad	A15ae	A15af	A15ag	A15ah	A15ai	A15aj	A15ak	A15al

(b) On-site Expense (Activities)

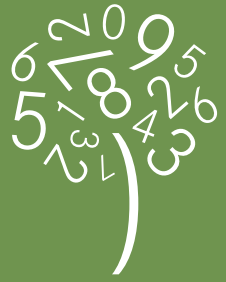
Boat								**Rubber Tube**															
Cost per Trip (Rs.)		No. of Trips		Total Cost (Rs.)		If Expense Shared 1. Yes 2. No		No. of Persons Who Shared Total Cost		Share of the Total Cost (inclusive of dependents, if any)		Rate per Hour		No. of Hours		Total Cost (Rs.)		If Expense Shared 1. Yes 2. No		No. of Persons Who Shared Total Cost		Share of the Total Cost (inclusive of dependents, if any)	
A15ba		b		c		d		e		A15bf		g		h		i		j				A15bl	

No of Costumes Hired		Rental Price of One Costume (Rs.)		Total Cost (Rs.)		If Car washed 1. Yes 2. No		If Cost Paid 1. Yes 2. No		Amount paid (Rs.)	
A15bm		A15bn		o		p		A15bq		A15br	

(c) On Site Expense (food & others) and Participation in Non-paying Activities

Restaurant						**Expense on Vendors**											
Total Bill Paid at Restaurant (for whole day) (Rs.)		If Expense Shared 1. Yes 2. No		No. of Persons Sharing Total Cost		Share of the Total Cost (inclusive of dependents, if any) (Rs.)		Spending on Vendors (for whole day) (Rs.)		If Expense Shared 1. Yes 2. No		No. of Persons Who Shared Total Cost		Share of the Total Cost (inclusive of dependents, if any) (Rs.)		Other Expenses	
A15ca		A15cb		A15cc		A15cd		A15ce		A15cf		A15cg		A15ch		A15ci	

Swam / Waded Today 1. Yes 2. No		Dependents Used Children's Play Rides Today 1. Yes 2. No	
A15cj		A15ck	



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