

NON-MARKET VALUATION OF THE SOOR SAROVAR BIRD SANCTUARY

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Abstract—Soor Sarovar Bird Sanctuary (SSBS), a small human-made natural ecosystem adjoins densely populated Agra on the national highway leading to the Indian capital city of Delhi. The case study evaluates its recreation value in total ecosystem services context. Zonal Travel cost method was chosen as per the availability of reliable secondary data and the initial qualitative assessment of the visitors. Templates used in the conventional Travel Cost Method survey was contextualized and tested for visitor survey spread to an entire year.

Sample size was determined to estimate the mean recreational value with $\pm 10\%$ precision. MS Excel's Pivot, Charting and statistical add-on tools were used for data analysis. The visitor's data was categorized in three travel zones within India and one zone was kept for foreign nationals.

Conventional parameters put recreation value of SSBS as 265 Million Rupees per year. Only six hundred foreign nations out of a total of Sixty-five thousand projected tourists contributed to more than thirty percent of the consumer surplus. Data analysis also gives insights as to what would make recreation and other services gain optimally. Indicated potential for growth on a substantial recreation value is good news.

Keywords: Recreation Value, Zonal travel Cost method, Soor Sarovar Bird Sanctuary, Eco-system Services.

1. INTRODUCTION

Soor Sarovar Bird sanctuary (SSBS) is a small but important bird habitat near Agra. The raw water for the human made Keetham Lake at Soor Sarovar is obtained from Agra Canal originating from Okhla barrage on River Yamuna in Delhi was engineered in 1870S (Jones, 1874). At Delhi Agra road, the Agra Canal water is diverted through Jodhpur branch into the lake. A part of the natural small lake was modified and extended into a big artificial lake decade ago to supply water to the Agra city in emergencies. It was managed for irrigating the adjoining agricultural fields and for commercial production of fishes. The fishery department used to do farming and selling of the fishes from the lake. Later on since 1980, water from the lake is piped by the Mathura refinery for refinery operations under a bilateral agreement with the

irrigation department of the Government of Uttar Pradesh (Uttar Pradesh Forest Department, 2010). Seeing the large number of migratory as well as resident birds arriving in this wetland year – after- Year, the area was declared a Sanctuary in 1991 (Soor Sarovar Bird Sanctuary, n.d.).

The benefits provided by natural ecosystems are both widely recognized and poorly understood (Pagiola, 2005). Measuring ecosystem service values is fraught with complexities involving balance amongst social, economic & environmental issues. (Runhaar) Such complexities are enhanced due to the knowledge gaps and information asymmetry. Studies have concluded that standard approach of Contingent valuation are unlikely to effectively reveal the preferences of people in developing countries (Christie Michael, 2019) and may infer very low value as compared to established travel cost method (Alora, 2015 .).

The study for estimating the recreational value through Zonal Travel Cost Method has been undertaken as a part of estimating the total value of ecosystem services provided by Soor Sarovar Bird Sanctuary (SSBS). Total economic value (TEV) framework considers various constituents of value, including direct use value, indirect use value, option value, quasi-option value, and existence value (Total economic value, 2005). For its authentic use in the cost-benefit ratio the values arrived at should be simple enough yet convincing and acceptable to stakeholders.

The economic values provided by any ecosystem near habitations can be viewed through measurability perspective as assessable and monetizable through conventional well-established methods and other difficult to measure benefits to human beings requiring inferential expert knowledge-based methods. Parameters and values of carbon stocks, firewood and recreational values can be estimated with certain confidence level through with certain error using statistical techniques; yet another set of values such as biodiversity and existence value etc. are harder to measure and would be

qualitatively inferred indirectly through expert judgement technique.

Policymakers must develop policy alternatives that are both satisfactory in terms of problem solving and that can count on enough support from stakeholders. Travel Cost method is an established method for evaluating the recreational value. The availability of reliable supporting data from secondary sources was also an important criterion.

2. METHODOLOGY:

2.1 Study Area:

Soor Sarovar Bird Sanctuary (SSBS) spread over 800 ha near Agra lies between latitude N27° 14' 4" and N27° 31' 51" and longitude E77° 49' 38" and E77° 52' 40". it has been named after Soordas - the great blind poet of Hindi literature, whose place of birth is said to be within the boundary of this sanctuary. A school for the blind, SoorKuti and a temple function within the sanctuary boundary.

A huge lake surrounded by dense and luxuriant vegetation of evergreen, semi evergreen and deciduous forests is a rare experience and picturesque sight in the urban area of the semi-arid part of the country. The sanctuary meets the criteria laid out by the International Bird Association (IBA) (IBA, 2019). Ministry of Environment, Forest and Climate Change, Government of India has also identified Soor Sarovar Bird Sanctuary's Keetham lake as important Wetland visited by migratory birds (wwfenvis, 2015).

The park also houses a Bear Sanctuary which is managed by Wildlife SoS with the support of Uttar Pradesh Forest Department. Recreational facilities include boating, trekking paths, watch towers and a children park.

total revenue that was deposited in each financial year from 2010-11 to 2016-17. Informal interactions with the tourists during 2015-2017 further suggested that most Indian tourists that visit SSBS came from Agra, Mathura and other rural and semi urban habitations around the sanctuary. Another segment could be from Delhi, Lucknow, Jaipur i.e. within a radius of 400 Kms. Tourists beyond these areas were frequented least and could possibly be thought of as yet another category.

Questionnaire Preparation:

The purpose of the study was deliberated with UP forest Department's experts and the Wildlife SOS (VISIT TO THE AGRA BEAR RESCUE FACILITY, n.d.) professionals at SSBS. Inputs from the willing tourists also formed an important input to the questionnaire finalization process. The questionnaire has been based on available Travel Cost template (Sharma, 2009) which was studied and contextualized for the study. The revision was also made to mitigate the possible biases on account of sampling error, frame error (duration of survey) , selection error and non-response error (Keith G. Diem). The questionnaire prepared while focusing on evaluating the Travel cost of the tourist included other such questions which could further reveal the difference in the properties of the likely travel zones as also provide clues on enhancing the visit experience.

The Questionnaire

The survey questionnaire was printed in bold fonts in both English and Hindi. It was divided into four themes. Through part 'A' the general information about the visitor was gathered; part B elicited the recreational behaviour of the tourist, while part 'C' focussed on the Travel and expenses of the trip the part 'D' closed the survey with the visitor's attitude on the recreational benefits.

The prime objective was toTCM...How and what can enhance its value.

Sample Size

The study aimed at calculating the recreational value of SSBS through Travel Cost modelling. The objective required to calculate the recreational value of SSBS @ 95% confidence interval with an error of 0.05 (five percent). A conservative population proportion of 0.5 was assumed to calculate the sample size using the formula. A Z-score of 1.96 was calculated.

The tourist Population for one-year study period 'N' was projected using the available tourist records provided by the UP-Forest Department for the previous years (From 2010-11 to 2016-2017) at SSBS. 64300 Indian Nationals and 600 foreign nationals totaling to 64900 visitors were projected to visit the SSBS.

$$n = \frac{z^2 \cdot p (1 - p) / e^2}{1 + z^2 \cdot p (1 - p) / e^2 N}$$

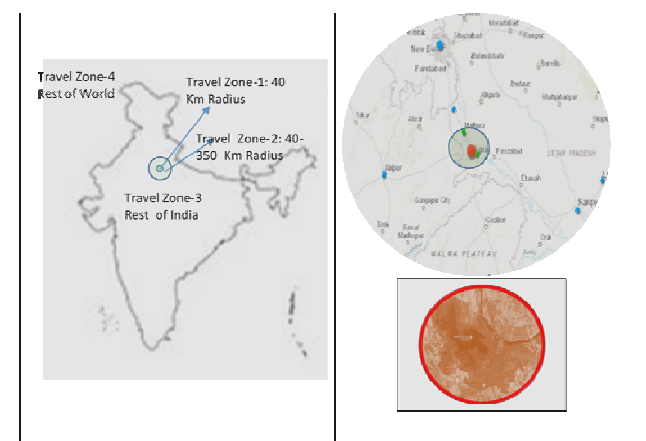


Figure 1: Key Plan of Soor Sarovar Bird Sanctuary & Travel Zones

Why Zonal Travel Cost Method was chosen

The forest department's tourist's historical data comprised of Indian and foreign nationals' numbers (Tickets issued) and the

The required samples using the above formula were worked out as 382. As the respondents were expected not to answer some questions, samples representing 414 entries to SSBS has been collected and entered in the database for analysis. To guard against period of the year bias samples points over the 12 months from December 2017 to November 2018 were recorded.

Sampling:

The questionnaire was printed both in English and Hindi (Devanagari) and choice of filling up was offered to the tourist being interviewed. The tourists were sampled while sitting and watching the scenery or waiting for their term for boat or relaxing at children park before leaving the sanctuary. Questionnaires representing 396 Indian and 18 Foreigner nationals were collected from December 2017 to November 2018.

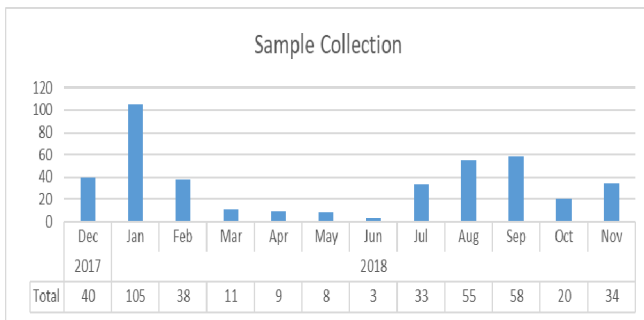


Figure 2: Month wise questionnaire data collected

The pattern in figure 2 matches the qualitative assessment that most of the tourists visit the SSBS during the bird's migratory season. More number of tourist questionnaire were filled up during the peak tourist season which lasts between November and March.

Data Analysis:

Data analysis was carried out using MS Excel's Pivot, Charting and statistical add-on tools.

- Data base structure was designed. Fields that may differentiate the properties of travel zones were included. Fields that can expand the recreational value of SSBS have also been included.

- Data was entered in excel spreadsheet in designated columns which were formatted as number, texts, dates or Logical fields as per the required or anticipated analysis.

3. RESULTS AND CONCLUSIONS:

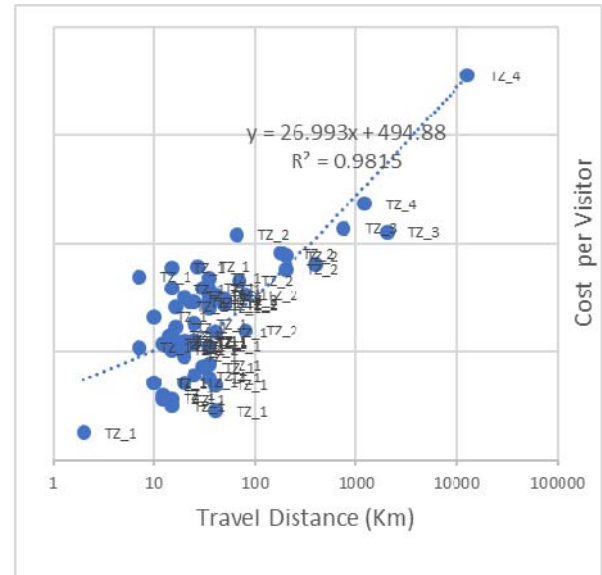
Relationship between Travel distance and Travel Cost

Data analysed confirms the zonal divide of tourists as

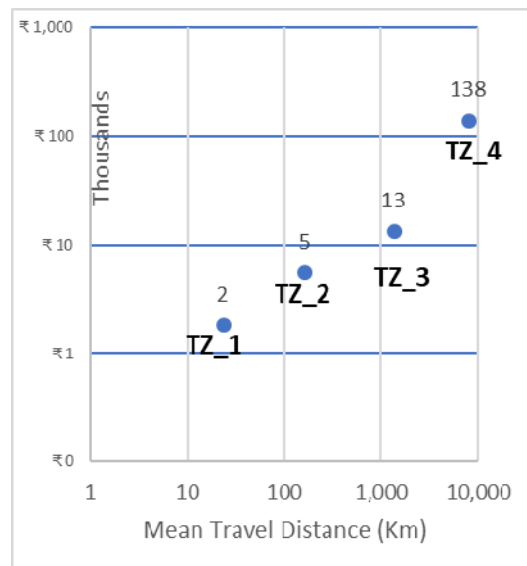
a. Indian and foreigners

- b. The Indian travellers data is divided into 3 divisions
 - i. Close up to Greater Agra and Mathura- Zone-1
 - ii. Distance Delhi, Lucknow, Jaipur and like- Zone-2
 - iii. Beyond 'C'- Zone-3

The foreign tourists have been grouped in Zone-4

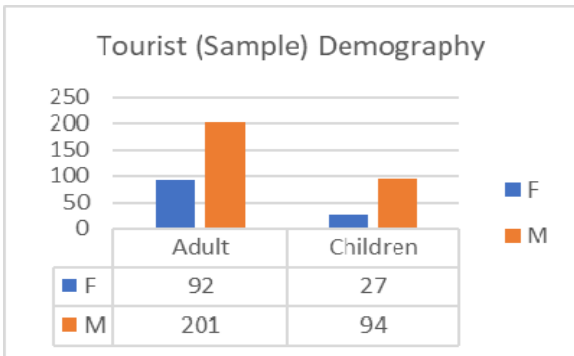


Relationship Between Travel Distance and Cost per Use

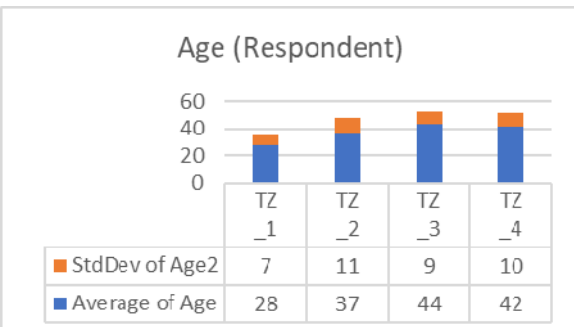


Zone Wise Mean Unit Cost and Distance

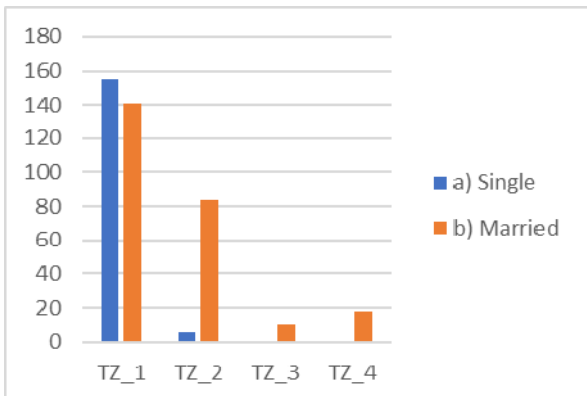
Figure 1: Relationship between Travel Distance & Travel Cost



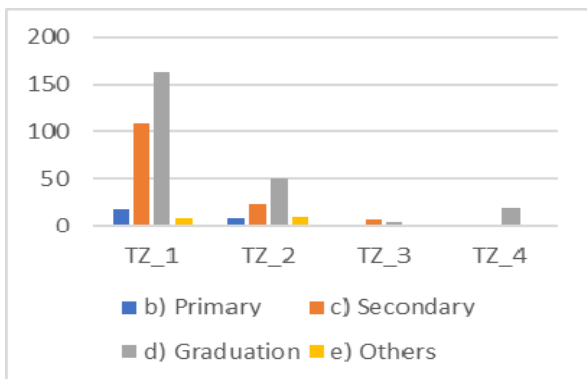
Age of Respondent



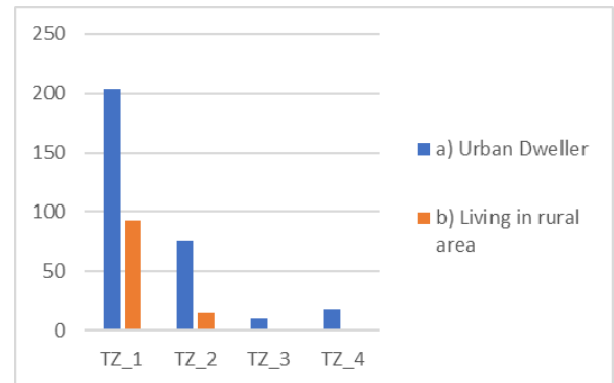
Marital Status



Level of education



Location: Whether Urban or Rural



Monthly Income in INR

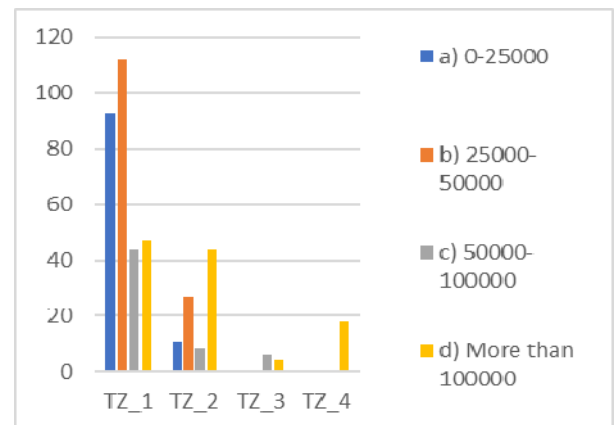


Figure 2: Traveler’s Recreational Behavior

4. RECREATIONAL VALUE CALCULATION:

Table 1: Consumer Surplus Estimates for the Whole Recreation

Travel Zone	Brief Description	Sample Numbers	Average Unit Cost (INR)	Average Travel Distance (Km)	Tourists Projected	Consumer Surplus Projected Total Value (INR)
TZ_1	Mathura, Agra (within 40 Km radius)	296	1,801	24	49581	₹8,93,06,771
TZ_2	Delhi, Jaipur, Lucknow (40-400 Km)	90	5,485	164	13170	7,22,34,351
TZ_3	Areas within India > 400 Km	10	13,205	1,375	1549	2,04,59,381
TZ_4	Foreign Nationals	18	1,38,373	8,133	600	8,30,23,501
		414			Yearly Recreation Value	₹26,50,24,011
					Recreation Value/Day	₹7,26,09,331

5. DISCUSSIONS:

We found the yearly recreational value for SSBS at a little over INR Twenty-Six Crores. Out of the projected Sixty-Five thousand tourists, fifty thousand (76.40%) visited from nearby towns of Agra, Mathura, their suburbs and rural areas surrounding the sanctuary. A little more than Thirteen thousand visitors came from a periphery beyond 40 Kms up to 400 Kms. Only about 2.5% of Indian visitors came beyond 400 Kms.

At a projected number of Six Hundred tourists, foreign nations formed a little less than 1% of total visitors. However, their contribution to the estimated consumer surplus amounts to more than 30% of the total.

The recreational value per unit area for SSBS accounts to Rs.330 per hectare. It fits into the wide estimate spectrum of similar areas given in Table-2.

Table 2-Comparison of Recreation value with other parks

Park/ Recreation Area	Area Ha	Study Year	Value/Ha/Year Converted to INR (Thousands)	Remarks- Method Used
Foy's lake, Chittagong	135	2015	19600	Have Joy Rides as well-ITCM used
Soor Sarovar Bird Sanctuary	799	2019	330	ZTCM – 4 Zones
Saravan Forest Park, Iran	1487	2017	35	ZTCM – 5 Zones
Oya Wetlands, Sri Lanka	274000	2010	0.7	
Kanha National Park	94000	2015	1.872	NTCA Study
Dudhwa National park	12700	2008	0.394	ITCM

Qualitatively, the consumer surplus value seems to be dependent on population around the park, park size and spots of visitor's interests. This wide variation opens a new area of research. However, it can be inferred that there is huge potential of enhancing the consumer surplus of SSBS.

Simplicity of the method as applied for the study and transformative use of digital technologies for ticketing would enable further tracking of the park's consumer surplus with ease and better precision. Observed reluctance to fill a lot of data of some of the respondent was overcome through additional survey. Hurried responses are however likely to affect the estimation to some extent. Reduction in the questionnaire size on the other hand would miss out on certain parameters. Taking answers form only with a lot of patience practical and sampling a certain type may even distort the results.

The non-market valuation of consumer surplus of the eco-tourism forms a major component of ecosystem service provided by the SSBS. Inclusion of Ecosystem services in the national policy documents as an SDG (Sustainable Development Goal) National Indicator require these to be mainstreamed in accounting and development paradigm. The study's findings of a significant amount and untapped potential for its enhancement is good news.

6. ACKNOWLEDGEMENTS:

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