Valuing Recreational Benefits of a Marine Protected Area: A Case of Pigeon Island National Park in Sri Lanka

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Abstract

Pigeon Island is one of the marine national parks in Sri Lanka. Rock pigeon, coral reefs, fishes, golden sand, sun and snorkeling sites enhances the attraction of many local and foreign tourists. These recreational activities have created so many negative impacts on the ecosystem itself and the protection of this natural recreational site is a timely necessity. Hence, this study attempted to estimate the recreational value of Pigeon Island National Park (PINP). Data were collected from 119 respondents using systematic random sampling method. 56.3% respondents are belong to 26 – 31 age category and single. Main occupation is recorded as self-employment and income varies from Rs.25000 to 35000 per month. Data from 117 respondents were used for calculating the Zonal Travel Cost and 76 sampling units used for the Individual Travel Cost method. Result of the zonal method shows that the total recreational value of Pigeon Island is 594.8 million Rupees per year (P value is less than 0 and R-squared is 57%) while Individual travel cost method estimates it as 524.9 million Rupees per year (P value less than 0 and R-squared is 67.5%).

Key words

Pigeon Island National Park, Travel cost method, Recreational value, negative impacts

1. Introduction

People depend on the natural environment for a variety of benefits to their wellbeing. Valuing nature and its program of research provides a venue in which researchers, policymakers, and practitioners can explore how better to take account of these benefits within decision making (Lipton et al., 1995). There is growing concern about environmental issues and an increasing demand for recreational activities and resources.

Environmental conservation is important to enable nature to get on with the job of keeping us and the planet healthy so that people and nature can thrive (Japan International Cooperation Agency, 2016). Marine and coastal ecosystems produce various services, including Provisioning services, Supporting services, Regulating services, Cultural services (Forest trends and Katoomba group, 2010).

Coastal areas are those which are most visited by tourists and in many coastal areas tourism presents the most important economic activity but negative impact also there such as Massive influxes of tourists, often to a relatively small area, have a huge impact. They add to the pollution, waste, and water needs of the local population, putting local infrastructure and habitats under enormous pressure (Zahedi, 2008).

Tourism plays a leading role in Sri Lankan economy. It serves a lot of foreign exchange to the country. So, Sri Lankan government pays attention to develop tourism. The tourism industry in the Eastern and Northern provinces of the country continued to grow with local and foreign investors, focusing their attention on harnessing the high potential for tourism in these provinces.

Sri Lanka as an island consist of a number of attractive and nature-based tourist destinations. Pigeon Island Marine National Park (PIMNP) is one of the best places to visit in the Eastern province. It is one of the two marine national parks in Sri Lanka. It is the only national park in the country to harbor a colony of the beautiful blue rock pigeons and contains some of the best remaining coral reefs in the country (Jayaweera, 2013).
The island is situated within the dry zone of Sri Lanka consists of two parts (islands): triangle shaped Island and Elongated shape Island. Small Island is Pigeon Island. The national park is rich in biodiversity. There are around 100 types of coral reefs and 178 species of fish on this island.

Travel cost method (TCM) is the technique used to estimate the recreational value on non-market resources or public goods using consumption behavior in related markets. The main aim of this method to determine the peoples’ willingness to pay to the visit. There are two approaches including individual and zonal. Zonal method is inexpensive and easiest method to estimate the recreational value. Individual method is same as zonal approach. But it uses individual survey data for the statistical analysis. This present study estimate the value of pigeon national park by using these two approaches.

2. Methodology

2.1 Study Area

Pigeon Island National Park (PINP) is located 1 km off shore of the Nilaveli beach, in the Trincomalee District, Sri Lanka (80 45’0” N and 810 9’0” E to 80 36’0” N and 810 14’0” E).

2.2 Survey design and Data collection, Questionnaire survey and data analysis

The visitors to the park were first divided into two categories i.e. local and overseas visitors. The overseas visitors have been omitted from the study to avoid the extremes that would come up due to their high purchasing power and other fees charged (i.e. transportation, lodging, entrance etc.) Data for the study were collected from both primary and secondary sources. Secondary data were collected (number of visitors to the PIMNP) from the visitor statistics maintained by the park wardens. Primary data were collected from a field questionnaire survey. The questionnaire consisted of 2 sections. Section 1 related to visitor’s socio economic characteristics and section 2 related to recreational travel characteristics. Information on area of residence, socio economic features, their visitation rates to PINMP, information on round trip mileage, travel costs, opportunity cost of travel time, length of the trip, time spent at the site and other locations visited during the same trip were obtained from the questionnaire. The questionnaire survey was administered for the randomly selected visitors from 09.00hrs to 17.00hrs during October 2017 to November 2017. The survey was conducted both in weekdays and weekends. Minitab 18 was used to analyze the data.

2.3 Method

The TCM evaluates the recreational use value for a specific recreation site by relating demand for that site (measured as site visits) to its price (measured as the costs of a visit). A simple TCM model can be defined by a 'trip-generation function' (tg) such as;

\[ V = f(C, X) \]

Where,
- \( V \) = visits to a site
- \( C \) = visit costs
- \( X \) = other socioeconomic variables which significantly explain \( V \).

TCM can be divided into two basic variants of this model according to the particular definition of the dependent variable \( V \). The 'Individual Travel Cost Method' (ITCM) simply defines the dependent variable as the number of site visits made by each visitor over a specific period, say one year. The 'Zonal Travel Cost Method' (ZTCM) on the other hand, partitions the entire area from which visitors originate into a set of visitor zones.

The ZTCM approach redefines the trip generating function (TGF) as;

\[ V_{hj}/N_{h} = f(C_{h}, X_{h}) \]

Where,
- \( V_{hj} \) = Visits from zone \( h \) to site \( j \)
- \( N_{h} \) = Population of zone \( h \)
- \( C_{h} \) = Visit costs from zone \( h \) to site \( j \)
- \( X_{h} \) = Socioeconomic explanatory variables in zone \( h \)

The visitor rate, \( V_{hj}/N_{h} \), is often calculated as visits per 1,000 population in zone \( h \).

We can specify the individual travel cost model as:

\[ V_{ij} = f(C_{ij}, A_{i}, Y_{i}, H_{i}, N_{i}, M_{i}, J_{i}, E_{i}) \]

Where,
- \( V_{ij} \) = number of visits made per year by individual i to site j
- \( C_{ij} \) = individual’s total visit cost of visiting site j

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Ai = age of individual i  
Yi = average income of individual i’s household  
Hi = size of individual i’s household  
Ni = size of individual i’s party  
Mi= marital status  
Ji= job of individual  
Ei= educational level of individual

Recreational value was calculated using Zonal travel Cost Method and individual travel method.

2.3.1 Zonal travel cost method
Total travel cost include round trip cost (only for travel) and opportunity cost of time for round trip. Round trip travel distance and time are calculated by using the Google map.

Total travel cost= travel cost for round trip + opportunity cost of time for round trip

Opportunity cost of time is calculated for round trip travel.

Wage rate = average monthly income/ (25*8)

Here,
25 is average working days in one month  
8 is average working hours in a day  

So
Opportunity cost of time is 33% of wage rate (Amoako-Tuffour and Martinez-Espineira, 2008)

Opportunity cost for time= (monthly income/25*8)*(33/100)

According to survey 15 administrative district were selected as zones (Ampara, Anuradapura, Badulla, Batticaloa, Colombo, Jaffna, Kegalla, Kilinochi, Kurunagal, Mannar, Matale, Mullaitivu, Polonnaruwa, Trincomalee, Vavuniya) and removed three zones such as Puttalam, Moneragala and Ratnapura because of the less two visits in survey. Out of the data of 116 visitors removed 3 zones and only 113 samples were considered for zonal travel cost method.

After the zone divided visitation rate (visits/1000) was calculated for each zone 29
Visits for zone = (No of responders/total sample size) ×Total visitors per year
(Visits/1000) = (visits for zone × 1000)/zonal population

Simple linear regression analysis was carried out using Minitab 18. Then added hypothetical entry fee with total travel cost and calculate the amount of visitors for each zone, Demand curve for zonal travel cost method was constructed. Area under the demand curve is consumer surplus (recreational value)

2.3.2 Individual travel cost method
Total cost for Pigeon Island, It includes travel cost for individual (round trip travel cost, round trip opportunity cost of time) +individual entry fee + individual food expenditure + boat cost for individual + equipment cost for individual

Total travel cost= travel cost for round trip + opportunity cost of time for round trip

Entry fee =ticket fee for person + (boats man ticket fee/no of trip members in the boat) +service charge + boat park fees + 15% Vat
Ticket for person =Rs.40 (Rs.20 for children)  
Service charge =Rs.300  
Boat park fees = Rs.125

Though there were 116 samples for the individual travel cost method 69 samples were considered and removed other samples because that samples were extreme cases. Regression analysis was done for total cost for Pigeon Island and other variables. According to suitable regression equation estimate visitation rate for total cost (cost for Pigeon Island). Demand equation and demand curve for individual travel cost method were estimated and consumer surplus was calculated (Recreational value)

3. Results and discussions
3.1 Age distribution of tourists to pigeon island national park
Figure 1 shows the age level distribution of the respondents. Out of that 56.3% of the respondents belong to 26-31 years old category. It is clear from the figure that more than 75% of the tourist who are visiting the PIMNP are belonging to 20-31 years old category. less than 20 years old category were omitted in this study because they don’t have enough income for calculate travel cost for PINMP
3.2 Marital status of tourists
Most of the tourist are unmarried who have 60.5% in the survey and 39.5% tourist are married.

3.3 Ethnic group percentage in my survey
High percentage of tourist ethnic group is Tamils (42%), 41.2% belongs to Sinhalese and 16.8% belongs to Muslims.

3.4 Education level of tourists
The majority of the respondents are having a degree and 34.5% of respondents are having a primary education. Out of the respondents, 29.4% have secondary education.

3.5 Type of occupation of tourist
Majority of the respondents are self-employment. It is about 34.5%. 27.7% of the respondents are working in government sector, 30.3% respondents are working in private sector and others (labors) have 7.6% in survey.

3.6 Results for zonal travel cost method
Based on linear regression analysis, R-squared is 57%. so visitation rate had strong negative relationship with total travel cost. And p value is less than 0.05 so this regression analysis is significance.
Maintaining cost and entry fees were comparatively minimum amount than consumer surplus so paper eliminate that amounts. According to zonal travel cost method, consumer surplus or recreational value of Pigeon Island is (area under the demand curve) is 594.8 million Sri Lankan rupees.

3.7 Results for individual travel cost method
Recreation value or consumer surplus according to individual travel cost method. 
Area under demand curve give the recreational value of Pigeon Island is 7117 rupees for individual 
So total consumer surplus =7117×76288 
= 524.9 million rupees

4. Conclusion
Pigeon Island have more recreational value according to the assumption of 40 rupees per kilometer. If we use per kilometer travel cost is low amount than 40 rupees recreational value became too low amount and if we use higher amount for per kilometer recreational value became very high. According to the estimation, recreational value of Pigeon Island for the zonal travel cost method is 594.8 million Rupees and Individual travel cost method is 524.9 million rupees.
5. References


