

USE OF ENVIRONMENT VALUATION TO ELEVATE GREEN INFRASTRUCTURE FOR SUSTAINABLE TOURISM IN THE PERI- URBAN LAKES IN INDIA

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ABSTRACT

In order to carry out the environmental valuation, Travel cost method (TRAVEL COST METHOD) (TCM) was used to assess the economic and environmental use values of the lake site. With the help of a questionnaire, a survey was done. To estimate the total individual travel cost, the following Hanley and Spash equation was used: $\Pi = \alpha_0 + \beta D + \beta F + \beta S + \varepsilon$. The results pertaining to GI (green infrastructure) in the lake site is obtained on the bases of survey and the responses by the respondents regarding the overall well-being and accessibility to the green-spaces within the park around the lake. The average cost of the individual or respondents was collected by using TCM on the basis of the data collected by the questionnaire method. The information for travel cost analysis requires parameters like individual transport expenditure, Entry fee, individual onsite expenditure and parking fee.

Key words: Environmental valuation, Travel cost method, Hanley and Spash equation, Green infrastructure

1. INTRODUCTION

India is currently facing some of the extreme development pressures because of continuous migration of population from villages to cities for the sake of livelihood. MGI (2010) projections predict that India's urban population will increase to 590 million in 2030 as compared to 340 million in 2008. India is also believed to be witness its urban population to increase over 700 million by 2050 (Swensen and Berg, 2020). Urban areas are considered as the centre for various activities such as economic, technological, financial, etc. and are centres of knowledge, skill and implementation centres for new technologies (Mukherjee, 2013). These characteristics and the increasing growth and employment generation in cities is acting as a magnet to attract people to the cities from the rural areas especially. This large-scale migration has seen an excessive stress on existing residential, commercial and transport infrastructure of the urban areas. The construction work in cities such as buildings, pavements, roads, etc., has resulted in loss of green spaces up to maximum extent (CSE, 2017). The need of the present is to recognise the importance of urban green spaces and establish certain technologies for overall ecological and environmental improvement of urban areas. Urban green spaces, such as parks, green roofs, streams, and community gardens, provide paramount ecosystem services and these green space also promote physical psychological and the overall well-being of an individual. It is also true to mention that it is a fact that urban green spaces are the foremost elements of great importance for the enhancement of quality of urban life (Nieuwenhuijsen, 2021; Wang and Benzhaf, 2018).

The significance of 'urban green' or 'green space' has been clearly mentioned and recognized in urban architecture as quoted by MacHarg (1971) referring to Ebenezer Howard for his Garden Cities, Charles Fourier for his Phalansteries and Ernest Calle for his Ecotopia. In context of the German Green book 'Green in the City' (Grunewald et al., 2017), urban green incorporates all forms of green urban open spaces as well as parks, houses, areas associated with sports, trees, vegetation around houses, areas devoted to wildlife, construction of pavements, woodlands and forests, private yards, agricultural lands, green roofs and green walls, etc.

The most common Ecosystem Services (ES) valued at the urban level are air quality, local climate, carbon sequestration and storage, and aesthetic appreciation and inspiration for culture, art, and design (Badola et al., 2010; Li and Gao, 2016; (Croci et al., 2021). Many methodologies are available to value ESs and some of them are Choice modelling and contingent valuation method, to value ESs that include regulating cultural and supporting services that can be valued by using Travel Cost Method (TCM) and Contingent Valuation (CV). Travel cost method was initially suggested by Hotelling (1949) and then developed by Clawson (1959) in order to estimate the values of recreational sites for environmental goods and services as they do not have monetary value. Therefore, TCM is also known as Clawson method. The TCM method is based on actual behaviour or what people actually do and their willingness to pay or what people say they would do in order to maintain the quality and importance of recreational site. TCM is considered as less costly than the other methods and the interpretation of results are easier than the any other proposed methods (Mohammadi limaei et al., 2014; Pirikiya et al., 2016).

TCM is one of the methods that is used to estimate the value of recreational sites using consumption behaviour in related markets. In other words, this method is a non-market procedure, where a particular recreational site value is estimated by considering how much people spend to access the site (travel costs, entry fees, on-site expenditures, travel time, etc.) and also it focuses on the willing to pay of the visitors for the betterment of the recreational site (Willis and Garrod, 1991; Smith, 1993; Soleiman et. al., 2017;). The method has become widely accepted and is regarded as one of the successful methods in terms of non-market valuation. The travel cost method estimates the economic value of recreational sites or other concentrated environmental amenities (e.g. wildlife observation, parks, lakes, etc.) by looking at the full travel costs (time, money spent out of pocket, and any applicable fees) of visiting the sites. The travel cost method is typically used to value sites that are used for recreation in terms of what is the price paid for a recreational site? i.e. price in terms of time and travel cost expenditure (along with any entry fee) that are incurred during a visit to the recreational site by the visitors. (Pawinee et al., 2005; Philip, 2013; Soleiman et al., 2017; Koshi et al, 2019;)

2. STUDY AREA

The present study was conducted in the vicinity of Sanasar Lake, Jammu province, JKUT as it is one of the important tourist places in terms of socio-economic, recreational and spiritual importance of Jammu city. The lake site studied to assess the economic value by using TCM (travel cost method) and green infrastructure.

SANASAR LAKE:

Latitude: 32.7287479

Longitude: 74.8614059

Surrounded by dense forest, small parks, temple and low-lying hills, Lake Sanasar, is a very popular picnic spot and Pilgrimage site for the tourists. It is situated 82 km from Jammu in the Ramban district. The lake supports many of the CITES and IUCN plants and animal species. A part from being a religious and sacred site, Lake Sanasar is also famous for its flora & fauna and the natural environment for many plants and animal species. Well-constructed cemented path has been constructed for watching scenic view and various species of birds and natural vegetation.

Materials used:

Google Earth satellite image to have an overview of the study area i.e. Sanasar Lake. Various materials were used like digital camera, questionnaires, notebook, pen, etc.

Software used: The data collected during the field study was tabulated and calculated using MS Excel. For further data analysis, the data was analysed in Statistical Package for Social Sciences (SPSS) 25. MS word was used for writing the information.

3. METHODOLOGY

In order to carry out the environmental valuation, Travel cost method (TCM) was used to assess the economic and environmental use values of the lake site.

With the help of a questionnaire, a survey was done. The questionnaire was developed and designed to collect various type of information (socio-economic parameters) for the study. An individual travel cost approach was adopted with the help of a detailed survey of tourists, using questionnaires and one to one interaction during the field survey.

The travel cost information was collected from 100 visitors to the Sanasar Lake and the average travel cost per visitor was calculated by tabulating and calculating the data obtained.

In order to conduct the survey at the site, the sample visitors were selected randomly and also depending on their willingness to respond.

To estimate the total individual travel cost, the following Hanley and Spash equation was used:

$$\Pi = \alpha_0 + \beta D + \beta F + \beta S + \varepsilon,$$

Where,

Π is the total cost of an individual to visit the site.

D is the distance costs for each individual dependent on the distance the person has to travel to the site.

F is the entry fee to the site.

S is the onsite expenditures of an individual at site, and

ε represents unobserved costs of an individual visiting the site.

α and β are constants.

4. OBSERVATIONS

Results regarding assessment of GI around the lake on the basis of survey:

The results pertaining to GI (green infrastructure) in the lake site is obtained on the bases of survey and the responses by the respondents regarding the overall well-being and accessibility to the green-spaces within the park around the lake. The results obtained on the basis of survey of the assessment of GI adoption in the lake site shows that maximum GI is adopted in the lake park because of the reason that the site is more of a tourist place and keeping it more relevant to green space by infusion of green infrastructure in the park. The first parameter of GI (Table:1) shows that the study areas do have a whole lake body which makes the place more scenic and calmer for the visitation purposes.

The results of the survey also showed that the lake site consists of permeable as well as impermeable (hard cemented) pavements. Permeable pavement is meant for the percolation of the run-off water into the ground water whereas impermeable (hard cemented) pavements are made in such a way that run-off water drains into the bioswales or the plants along the street side (green street). The survey regarding their adoption of GI in the park (lake site) also showed the positive results regarding green streets that is fully bloomed with the vegetation and the parking site of the area which inclusively designed in a way that run-off water or rainwater percolated through the pervious pores of the pavements.

The trees around the street or along the walking path and around the lake mainly comprises of the trees that absorbs excess of noise from the nearby and gives a healthy and peaceful environment to the visitors as well as the wildlife around the lake. On a whole of the survey of the lake site in terms of GI it was observed that maximum of the provisions related to GI are adopted at some extent in the lake site. However, certain parameters are still needs to be adopted by the authorities like Green vertical gardens, green roofs to combat heat problems. Planter boxes around the lake to make it more green space and more attractive for the visitors, etc.

Table:1: Results of the assessment of GI in the proximity of the Lake-site (yes = 1; no = 0)

GI ELEMENT	DESCRIPTION	ASSESSMENT IN THE STUDY AREA
OPEN WATERBODIES	Vegetated wetland, Lake, etc.	1
NATURAL OR SEMI NATURAL GREEN SPACES	Conservation land, woodland, etc.	1
PLANTER BOXES	vertical green walls	0
BIOSWALES	mulched and vegetated channels that retains runoff	1
PERMEABLE PAVEMENTS	surfaces that infiltrate stormwater where it falls	1
GREEN STREETS	streets that follows GI elements like permeable pavements, bioswales, trees etc.	1
GREEN PARKING	include permeable pavements	1
GREEN ROOFS/WALLS	roofs that covered with vegetation	0
TREE CANOPY	trees helps to slows down runoff and erosion	1
LAND CONSERVATION	protection of open spaces	1
CONCRETE INFLOW STRUCTURES	areas that are impermeable but have necessary slope to direct runoff to bioswales.	1
PROVISION FOR NOISE CONTROL	canopy that works as sound buffers	1
PROVISION FOR RECREATION/ENTERTAINMENT	cycling pathways, fun zone for kids etc.	1
WILDLIFE HABITAT	inclusion and conservations of mainly animals and birds	1

AGRICULTURAL LAND	open spaces that are cultivated for agricultural purposes	1
OVERALL MULTIFUNCTIONALITY OF THE AREA	Greater diversity of greenery provides a number of activities related to gardening, sport, leisure, children's play, and activities with pets.	1

5. CONCLUSION

Coefficient of correlation between socio-economic parameters and frequency of visits

annually to the lake he matrix of correlation in between five variables i.e., Frequency of visits, Monthly income, willingness to pay (WTP), travel time to reach and Transport expenditure shows that there is strong correlation between Transport expenditure and travel time to reach, however it is significant at .01 level which indicates that if travel time increases by 1 percent there will be increase in .533 rupees. So. It is directly related to one another. On the other hand, there is positive correlation between transport expenditure and frequency of visits which is significant at .01 level which shows that if the frequency to the site increases 1 percent by the visitors so the expenditure will increase by .478 rupees, which again shows a direct relation of both the variables.

The willingness to pay as a significant relationship with a significance of 5 percent with the monthly income of the visitors to the lake site. It shows that there is a direct relationship between the increase in monthly income of the visitors and their willingness to pay for overall protection and maintenance of the park.

Average individual travel cost analysis:

The average cost of the individual or respondents was collected by using TCM (TRAVEL COST METHOD) on the basis of the data collected by the questionnaire method. The information for travel cost analysis requires parameters like individual transport expenditure, Entry fee, individual onsite expenditure and parking fee. The average individual travel cost was estimated to be 528.55 rupees after the addition of all the parameters mentioned above.

6. REFERENCES

- [1] Abdul, M., Nurhayati, Mariapan, Manohar, Shariff, M., Mustafa, K., & Aziz, A. (2010). Assessing the Quality of Green Open Spaces: A review. Conference: Healthy Parks Healthy People 10.13140/2.1.3608.6725.
- [2] Akbari, H., Pomerantz, M., and Taha, H. (2001). Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. *Sol. Energy*, 70, 295-310.
- [3] Allen, P.G., Stevens, T.H., and More, T.A. (2009). Measuring the economic value of urban parks: A caution. *Leisure Sciences: An interdisciplinary Journal*, 7(4) 467- 477.
- [4] Bele, A., and Chakradeo, U. (2021). Public Perception of Biodiversity: A Literature Review of Its Role in Urban Green Spaces. *Journal of Landscape Ecology*, 14(2):1-28.
- [5] Boardman, A. E., Greenberg, D. H., Vining, A. R., and Weimer, D. L. (2001). *Cost-benefit analysis: concepts and practice* (4 th ed.). Prentice Hall.
- [6] Das, B. K., & Malik, M. A. (2010). Biogeochemistry and paleoclimate variability during the Holocene: a record from Mansar Lake, Lesser Himalaya. *Environmental Earth Sciences*, 61(3), 565-574.
- [7] Grete, S., and Sveinung, K. B. (2020) The 'garden city' in the green infrastructure of the future: learning from the past. *Landscape Research*, 45(7):802-818.
- [8] Gunwoo, K., Patrick, A., and Miller. (2019). The impact of green infrastructure on human health and well-being: The example of the Huckleberry Trail and the Heritage Community Park and Natural Area in Blacksburg. *Virginia, Sustainable Cities and Society*, 48, 2210-6707,
- [9] Handley, S.E., Ennos, J.F., and Pauleit, A.R. (2007). Adapting Cities for Climate Change: The Role of the Green Infrastructure. *Built Environment*, 33(1): 115-133.