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The Value of Recreational Ecosystem Services in India

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Abstract: Forest ecosystem services have been a vital role in human well-being. Particularly, recreational ecosystem services are creating physical and mental well-well being of human being. Therefore, the main objective of the paper is to estimate the economic value of recreational ecosystem services provides by the two recreational sites such as Nandi Hills and Nagarhole National Park based on the Individual travel Cost Method in Karnataka, India. This study has used a random sampling method for 300 tourist visitors to recreational sites. The present study has also estimated the consumer surplus of the visitors. The result of the study has found that (i) economic value of two creational sites has estimated at the US $ 323.05 million, (ii) the consumer surplus has estimated for Nandi Hills at US$ 7.45 and Nagarhole National Park at US$ 3.16. The main implication of the study is to design the entry fees for the recreational site and sustainable utilization of recreational ecosystem services for the present and future generations.

Keywords: Forest; Ecosystem Services; Travel Cost Method; India

1. Introduction

Forests are provides a number of ecosystem services to human being (Costanza et al 1997; MEA, 2005; TEEB 2010; Ninan and Kontoleon 2016). Forest ecosystem services are classified the four major types such as provisioning services (wild foods, raw materials etc,.), regulating services (climate regulation and weather etc,.), cultural services (spiritual and recreational services) and supporting services (habitat services) (MEA, 2005). Forest ecosystem services have provided a vital benefit for instance, poverty reduction (FAO, 2020; Cheng et al 2017; Wunder et al 2014) and environmental benefits (Jenkins 2018; Girolami 2018; Pearce 2001 and Mori 2017). Forest ecosystem services has also contribute to household income for the forest depended communities, Angelsen and Wunder, 2003; Shackleton and Shackleton 2004 and Paumgarten 2005). Cultural ecosystem services have been vital role in the human being (see table 1). However, Angelsen et al (2014) estimated the 28% income earned from forest in the developing countries. Further, forest ecosystem services have provided recreational ecosystem services. Recreational ecosystem services has described as the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience (MEA, 2005). Recreational ecosystem services have the strong association between human-nature interaction (Moon and Blackman, 2014). However, there are a number of studies have been estimated the economic value of ecosystem services in India for example, Verma et al., (2017) estimated the economic value and stock of six tiger reserves at US $ 128 million to US$ 271 million and US $ 344 million to US$ 10.08 billion respectively. Ninan and Kontoleon (2016) have estimated the value of ecosystem services has provided by US$ 13-148 million based on various economic valuation methods for the Nagarhole National Park in Karnataka. Badola

et al (2010) have calculated the value of recreational ecosystem services US 167,619 and value of carbon sequestration at US 63.6 million for Corbett tiger reserve. The economic value of recreation services at Rs 4.4 million provided by Lalbagh botanical garden based on the travel cost method (Balasubramanian 2017). Moreover, considering that India accounts for a major global biological diversity, ecosystems like forests, wetlands etc., provide more number of benefits to human beings. But, the existing economic growth models being followed the world over has increasingly led to the degradation of ecosystems and their valuable services. Therefore, there is a need for more number of economic valuation studies for a better understanding of the importance of ecosystem services as well as sustainable use of ecological resources. Moreover, most of the studies focus mainly on the tangible benefits of a very few ecosystem services.

The recent global studies on the value of recreational ecosystem services for example, Starand et al (2018) has estimated the value of Amazon forest ecosystem services at US$ 68.47 to US$ 822.76 million that includes the value of nuts, rubber, timber, livestock, energy, CO_2 sequestration etc. The value of ecosystem services provided by the Andassa watershed of the Upper Blue Nile basin of Ethiopia has been estimated at US$ 22.58 X 10^6 in 2000 (Gashaw et al., 2018). The economic value of 11 ecosystem services in China has been estimated at US$ 5.63 trillion for 2010. Among the 11 ecosystem services, regulating ecosystem services has contributed the highest value at 71% in the respect of China (Xie G et al 2017). In the India context, a number of studies have been estimated that the value of recreational ecosystem services, based on the travel cost method and contingent valuation method. The economic value of recreational ecosystem services has been estimated at the US$ 0.41 million, based on willingness to pay method for the Nagarhole National Park in Karnataka (Ninan, K.N. and Kontoleon, A., 2016). Further, the economic value of recreation ecosystem services provided by Little Rann Kachchh has been estimated at the US$ 4.6 million, based on individual travel cost and contingent valuation method (Dixit et al., 2016). On the other side the value of recreational services, based on secondary data has been estimated at the US$ 6.5 million for Periyar tiger reserve in Kerala (Verma et al., 2017). The Corbett Tiger reserve accounts for the economic value of recreational services at the US$ 167,619, based on the individual travel cost method (Badola et al. 2007). The recreational value of coastal and marine ecosystem services, based on the zonal travel cost method, has been estimated at the US$ 531 billion for 2012-13 (Mukhopadhyay, P. and DaCosta, V., 2015). Whereas, the economic value of Dachigam national park in Jammu and Kashmir, based on the travel cost method, has been estimated at US$ 4.5 million (Dewsbury, et al., 2016). Furthermore, some studies have been estimated the value of urban park recreational services. For example, the value of recreation services provided by Lal Bagh botanical garden based on the individual travel cost method has been estimated at Rs 4.4 million Balasubramanian M (2017). There are studies that have dealt with the valuation of recreational sites in Karnataka. The recreational value has estimated the protected areas of Western Ghats (Mohandas and Rema Devi 2011), based on the travel cost method the average consumer surplus per visit Rs. 290. A similar study carried out in the valley of a national park shows that the net recreational benefit at Rs. 5,88,332 and the average consumer surplus Rs. 194.68 (Gera et al. 2008). The total recreation value of Dandeli wildlife sanctuary using the travel cost method for 2004-05 has been estimated at Rs. 37,142.86 per Sq. km and the total value of Rs. 1,76,43,600 (Panchamukhi et al. 2008).

Table 1. Cultural Ecosystem Services and related goods & Services.

Cultural Ecosystem Services	Examples of related goods and services
Opportunities for recreation and tourism	Hiking, camping, nature walks, jogging, winter sports, wild watching, horse riding, hunting etc..
Aesthetic values	Enjoyment of rural, unique and colourful landscapes, individual habitats and species and tranquillity supporting mental well-being.
Inspiration for the art, science and technology	Writing, painting, design, documentaries, movies, engineering materials and architecture
Information for education and research	Education trips by schools and other groups; employees training; research related to ecosystem function, publications and patents.
Spiritual and religious experience	Natural and built scared places, philosophy and faith; support to mental well-being.
Cultural identify and heritage	Landscape and habitats formed by human activities, speices of spiritual importance,

	traditional and indigenous knowledge

Source: Gantioler and Amato, 2013; MA 2005; de Groot et al 2010 .

Most of the Indian studies has been estimated consumer surplus for recreational site for instance, Ninan and Kontoleon (2016) have estimated consumer surplus for the domestic visitors at Rs 227 and foreign visitors at Rs 1384 for Nagarhole National Park in Karnataka. Jala and Nandagiri (2015) calculated consumer surplus at Rs 238 for Pilikula Lake in Karnataka. Further, Badola et al (2010) estimated the value of consumer surplus at the US$ 2.5 for Corbett Tiger Reserve in Uttarakhand. Verma *et al* (2015) estimated the value consumer surplus for the four tiger reserves in India. Among the four tiger reserves, Kanha Tiger Reserve (KTR) has the highest consumer surplus value at approximately Rs 2,558, Kaziranga Tiger Reserve with second highest consumer surplus at about Rs 187. Third and fourth place were occupied by Periyar Tiger Reserve and Corbett Tiger Reserve with consumer surplus estimated at about Rs 147.38 to Rs 161.32 and Rs 150 respectively. Balasubramanian (2020) estimated the economic value of consumer surplus for three protected areas such as Biligiri Rangaswamy Temple Wildlife Sanctuary (Rs 38.24), Bannerghatta National Park (Rs 191.73) and Nagarhole National Park (Rs 557.33) per visit to the recreational site.

2. Materials and Methods

2.1. Study Area

Karnataka has been a number of economic valuation studies conducted with respect to protected areas, but there is no economic value of recreational services study Nandi Hills. Nandi hills are an old hill fortress or evergreen forest patch at the top in Chikkaballapur district of Karnataka. It is 10 km away from Chikkaballapur town and approximately 60 km away from the city of Bangalore. Bangalore is home to a number of private companies with people from different parts of the country working there exhausts them and so on weekends, people like to visit different places in and around Bangalore and Nandi hills also is one such natural outdoor recreation place. Also it is near to Bangalore, and hence many people it visit during weekends, as a quick getaway from their routine life. The Department of Horticulture is maintaining the hill top and climate with several plant species introduced across an experimental garden, large-scale exotic botanical garden (140 acres), music stage (three-and-a-half-acre), food court and temple. The hills are very rich in fauna, making this location popular for birdwatchers and bird photographers. The climate during winter is the best with the hill top covered with dense attracting and people to visit and also this place is home to many migrant bird species ant (ex. Warblers, flycatchers), such as Nilgiri woodpigeon and some species of Western Ghats (Uropeltid snakes, malbar whistling thrush) . The hill slopes are home to endemic species of peninsular India (yellow-throated bulbul). Nandi Hills is one of the best places for hiking as well as trekking for beginners. Tourists come from various parts of Bangalore, surrounding districts and other states for viewing the unique nature of the hill. Second, Nagarhole National Park is located in the Kodagu and Mysore districts in Karnataka. There are more number of visitors has been visited to the park during the week days and week end days.

2.2. Data Collection

In order to estimate the economic value of recreational ecosystem services being provided by the Nandi Hills and Nagarhole National Park, we undertook a field survey in December 2019 for obtaining empirical data on the number of visits, travel expenditure and other socio-economic variables. The field data collection was undertaken through in-person interview (Nandi Hills n=150) and Nagarhole National Pak (n=150) who were randomly selected near the entrance or inside the Nandi Hills and Nagarhole National Park. However, this study did not cover any foreign tourists due to their unavailability in the recreation site during the study period.

2.3. *Data Analysis*

2.3.1. Travel Cost Method

The purpose of this study is to estimate the recreational benefit of Nandi hills and Nagarhole National Park, using Travel Cost Method (TCM). TCM is used to calculating the value of some goods or services that cannot be obtained through market prices such as forest parks, ecosystems, beaches, etc. The economic value is measured purely based on people's preferences. Thus, the theory of economic valuation is based on individual preferences and choices. People express their preferences through choices and trade-offs that they make, given certain constraints, such as those related to income or time availability (Ecosystem Valuation, 2013). Travel cost method was first introduced by Hotelling in 1947 for valuation of protected areas (Heagney et al., 2019) and TCM is one of the best valuation methods for estimating the economic value of recreational ecosystem services (Anderson, D.M., 2010). Travel Cost Method is defined by a 'trip-generating function', this study has used the following formula by (Bateman et al., 2019)

$$V = f(C, X) \quad (1)$$

V is the number of visits to the site, C is the visitor cost and X is the other socio-economic indicators that considerably describe in V. Travel Cost Method has defined the independent variables (V) as the number of visit made by each visitor to a national park or wildlife sanctuary or any other recreational site over a specific period. The number of visits to the Nandi hills has been estimated based on the time, cost incurred on travelling to the hill. The time and costs of travel vary from visitor to visitor depending on the point of origin. The value of a site also depends on how many people are willing to pay to visit that place. It is called revealed preference method, because the actual behaviour and choices are used to account the environmental values.

2.3.2. Econometric Model

The travel cost method makes possible the evaluation of individual preferences for expenditure on non-market goods. Khan (2004) explains that the travel cost method uses the cost of travelling to a non-priced entertaining location in order to presume the recreational benefits provided by the site. The present study interviewed 300 visitors to the Nandi Hills and Nagarhole National Park. A basic econometric model used in this study shows the number of visitors is the independent variable to Nandi Hills and Nagarhole Natioal Park as functional factors such as travel cost, age, residential location, household income, age, residential local, household income, household size, educational status and quality of the park. Hence, the trip - generating functions for the entire datasets are described below.

$$r_i = \beta_0 + \beta_1 travel\ cost + \beta_2 age + \beta_3\ residential\ location + \beta_4 household\ income + \beta_5\ household\ size + \beta_6\ educational\ status + \beta_7\ quality\ of\ the\ prk + e_i$$

Where r_i the dependent variable stands for the number of visits by the **i**th individual to Nandi Hills and Nagarhole National Park per period of time; *travel cost* denotes the round trip total cost of an individual's residence to and from the site and includes the opportunity cost of travel time and stay at the park.

2.3.4. Consumer Surplus

Consumer surplus has been described as "the difference between the total travel costs incurred by a visitor to a tourist site and the highest amount the visitor is willing to pay to make a visit to the

site" (Timah, P.N., 2011). The consumer surplus has been obtained (Gillespie, M.A. and Wratten, S.D., 2017)

$$Consumer\ Surplus = \frac{-1}{\beta_{TC}}$$

The total annual recreational value of the site can be estimated by multiplying the individual consumer surplus with the total number of visits during the year.

$$CS = \frac{-1}{\beta_{TC}} X\ total\ number\ of\ visitors\ per\ year\ to\ the\ site$$

3. Results and Discussion

This section is highlight result and discussion. The result of the study is found that the young age respondents have the more visit to the recreational site. In addition, the two study areas such as National park and Nandi Hills have received high young people visitors. Further, this study has estimated that the university level education respondents are more number of visits compared than other level of education. Furthermore, the 65 percent of respondents are earning Rs 25000 to Rs 50000 and married respondents were created more number of visits to the recreational site. (Table 2).

Table 2. Socio-Economic Status of tourist respondents.

	Nagarhole National Park	Nandi Hills
Age		
18-40	78	66.66
41-60	20	29.33
Above 60	1.3	4
Education		
Illiterate	1.3	6
Primary	2	18
Secondary	24.7	70
University level	72	5.33
Household Income		
Rs 10000 - Rs 25000	13.3	14.7
Rs 25000 - Rs 50000	78.7	47.3
Rs 50000- Rs 75000	8	38
Rs 75000 and above	0	0
Marital Status		
Single	8.1	44.67
Married	86.7	54
Widow	0	1.3
Household Size		
2 to 5	80	75.3
6 to 10	17.3	20
Above 10	2.7	5.7

Source: Author's estimates.

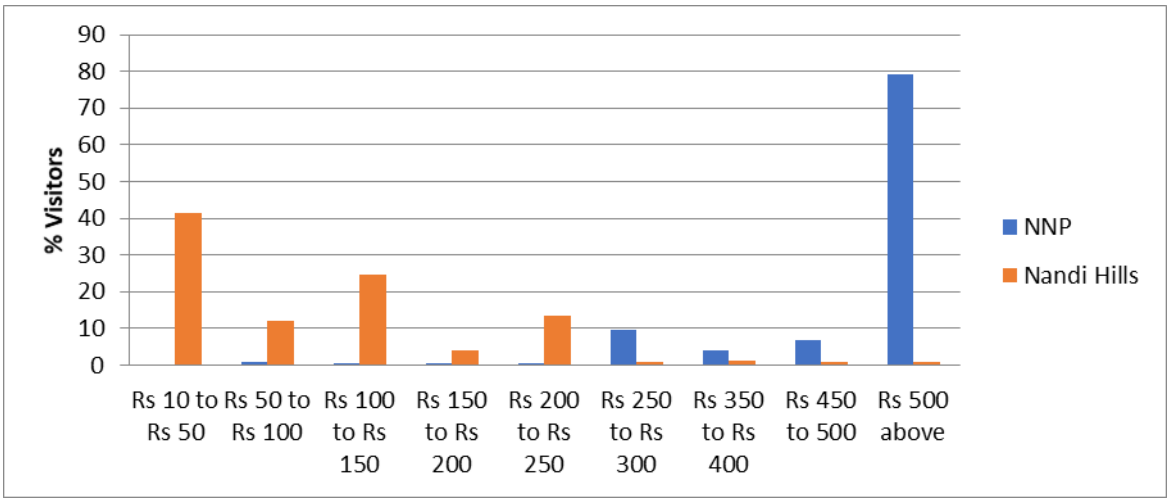

Figure 1. Respondent's willingness to pay. Source: Author's estimates.

Figure 1. highlights that respondent's willingness to pay for visiting to the parks. The tourist visitors ready to pay from Rs 10 to the above Rs 500 for visiting to the recreational sites. Nagarohle National Park has been received the highest willingness to pay compared than the Nandi Hills in Karnataka. Fig 1 shows that the 80 percent of tourist visitors are ready to willing to pay more than Rs 500 and above for visiting to the Nagarhole National Park. Moreover, the 25 percent of the visitors are ready to willing to pay between Rs 100 to Rs 150 and 48 percent of the visitors are willing to pay Rs 10 to Rs 50 for the Nandi Hills. This figure is clearly shows that a few tourist respondents are ready to pay the range between Rs 250 to Rs 350 visiting to the recreational sites. Overall, this study has found that the visitors average willingness to pay the range between Rs 150 to Rs 200 to both the Nagarhole National Park and Nandi Hills in Karnataka. Fig 2 highlights the frequency of visits to the recreational site, the minimum one visit and maximum more than visits. The 75 percent and 65 percent of the respondents have visiting to the one visit to the Nagarhole National Park and Nandi Hills respectively. The 25 percent of the tourist visitors are visiting to at least two times to the recreational sites. Moreover, less than 10 percent of the tourist respondents are visiting three to four time to the tourist areas. Further, less than 5 percent of the respondents are visiting more than five times visiting to the recreational sites.

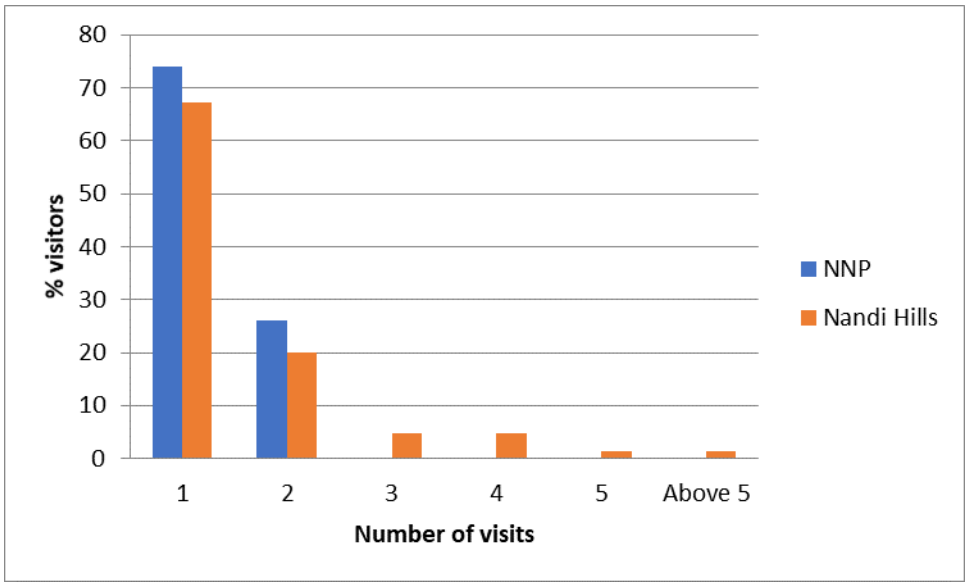

Figure 2. Frequency of visits to the site. Source: Author's estimate.

Table 3 highlights the regression results of the individual travel cost method for both the recreational site in Karnataka. Travel cost is significant and negatively correlated. Table 3 indicates that one percent increase in the travel cost has impacts on 1.7 percent decrease in the number of trips for Nagarhole National park and 3 percent decrease in the Nandi hills trips respectively. Age and number of trips are statistically significant and negatively correlated, old age people have less visits to the recreational site compared than the young age respondents. Residential locations and visiting to the recreational site are statistically significant, one percent increase in the distance impacts on 1.9 percent and 1.7 percent Nagarhole National Park and Nandi Hills. In addition, household income statistically significant with the number of trips, for example, one percent increases in respondent's income impact on 2 percent increase number of visits to the Nagarhole National Park and Nandi Hills in Karnataka. In addition, household size, marital status, quality of the park and educational status are not statistically significant but positively correlated with the recreational site. Table 4 shows that consumer surplus and economic value of the two recreational sites for Nagarhole National Park and Nandi Hills. The consumer surplus has estimated for Nagarhole National Park Rs 247 and Nandi Hills Rs 557 respectively. In addition, the economic value of NNP has estimated at 55.8 million and 2.47 billion for the Nandi Hills.

The result of the study has found that (i) economic value of two creational sites has estimated at the US $ 323.05 million, (ii) the consumer surplus has estimated for Nandi Hills at US$ 7.45 and Nagarhole National Park at US$ 3.16. The similar results have found that the various recreational sites for example, Mayer et al (2010) have estimated the value of tourism 525 million euros in the six Germann national parks based on travel cost method. An economic value of recreational ecosystem services has been estimated at $AUD 3.3 billion per year provided by New South Wales in south-eastern Australia (Heagney et al 2019). Further, the value of recreational ecosystem services has been estimated US$ 31.8 million for McKenzie Lake, Fraser Island based on travel cost method (Fleming and Cook, 2008). Economic value of Gold Cost beaches has been estimated at US$ 500 million per year based on travel cost method for Australia (Zhang et al., 2014). The value of recreational ecosystem services provided by Coorong, Austrialia has been estimated at US$ 30.5 per year (Rolef and Dyack, 2011). The value of recreational benefits has been estimated at 359 to 574 euro per visit to the Marine Nature Reserve (MNR) in the United Kingdom (Ryul Chae, 2011). Economic value of the Poseidon temple in Sounio, Greece has been estimated at 1.5 – 24.5 million per year based on travel cost method (Tourkolias et al, 2014).

In India, there are a number of studies have been investigated the value of recreational ecosystem services for national parks, wildlife sanctuaries. For instance, Bharali and Mazumde (2012) have estimated the value of recreational ecosystem services has been estimated at Rs 773.45 million for the Kaziranga National Park based on travel cost method. the economic value of Nagarhole National Park, especially recreational ecosystem services has been estimated at US$ 0.41 million, based on willingness to pay method (Ninan, K.N. and Kontoleon, A., 2016). The economic value of recreation ecosystem services provided by Little Rann Kachchh has been estimated at US$ 4.6 million, based on individual travel cost and contingent valuation method (Dixit et al., 2016). On the other side the value of recreational services, based on secondary data has been estimated at US$ 6.5 million for Periyar tiger reserve in Kerala (Verma et al., 2017). The Corbett Tiger reserve accounts for the economic value of recreational services at US$ 167,619, based on the individual travel cost method (Badola et al. 2007). The recreational value of coastal and marine ecosystem services, based on the zonal travel cost method, has been estimated at US$ 531 billion for 2012-13 (Mukhopadhyay, P. and DaCosta, V., 2015). Whereas, the economic value of Dachigam national park in Jammu and Kashmir, based on the travel cost method, has been estimated at US$ 4.5 million (Dewsbury, et al., 2016). Furthermore, some studies have estimated the value of urban park recreational services. For example, the value of recreation services provided by Lal Bagh botanical garden based on the individual travel cost method has been estimated at Rs 4.4 million (Balasubramanian M (2017). There are studies that have dealt with the valuation of recreational sites in Karnataka. The recreational value in respect of the protected site of Western Ghats (Mohandas and Rema Devi 2011), based on the relationship between travel cost and visitation rate and willingness to pay has been

estimated at Rs. 26.7 per visitor and the average consumer surplus per visit Rs. 290. A similar study carried out in the valley of a national park shows the net recreational benefit at Rs. 5,88,332 and the average consumer surplus Rs. 194.68 (Gera et al. 2008). The total recreation value of Dandeli wildlife sanctuary using the travel cost method for 2004-05 has been estimated at Rs. 37,142.86 per Sq. km and the total value of Rs. 1,76,43,600 (Panchamukhi et al. 2008). Similarly, a study based on the willingness to pay for the preservation of watershed in Karnataka indicates a value of Rs.125.45 per hectare and a total value of Rs. 480 million (for 2004-05). Further, Balasubramanian (2020) estimated the value of recreational ecosystem services based on individual travel cost method for Bilgiri Rangaswamy Temple Wildlife Sanctuary (Rs 3.8 million), Nagarhole National Park (Rs 55.8 million) and Bannerghatta National Park (Rs 19 million) for Karnataka.

Table 3. Regression results of recreational values of NNP and Nandi Hills.

Variables	Coefficient t-statistics) NNP	Coefficient (t-statistics) Nandi Hills
Intercept	0.980 (2.761)	1.823 (4.037)
Travel Cost	-1.014E-5 (-1.716)**	-.247 (-3.074)***
Age	-0.009 (-2.136)**	-.175 (-2.212)**
Marital Status	0.113 (1.110)	0.431 (2.301)
Household size	0.060 (1.264)	0.049 (2.386)
Educational status	-0.017 (-1.285)	0.983 (2.487)
Residential location	0.139 (1.969)**	0.140 (1.750)*
Household Income	3.880E-6 (2.108)**	0.149 (1.846)*
Quality of the park	-0.47 (-1.258)	-0.32 (-1.130)
R^2	14.0	12.9
F-Statistics	2.837	2.273

Note: ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 4. Economic Value of Recreational Ecosystem Services in Nandi Kills and Nagarhole National Park.

Components	Nandi Hills Value in (Rs)	Nagarhole National Park
Individual Average Consumer Surplus	Rs 247	Rs 557.33
Total Economic Benefits	Rs. 2.47 billion	Rs 55.8 million

Source: Author's estimate based on primary survey.

4. Conclusion:

Recreational ecosystem services are one of the vital roles to human well-being. Most of the developing and developed people they are more interested in tourism and recreation. Recreational ecosystem services have important role in the mental and physical well-being of the people. However, recreational ecosystem services have created more number of economic and employment opportunity to local people. The present study has estimated the value of recreational ecosystem services for two recreational sites such as Nagarhole National Park and Nandi Hills in Karnataka

based on the Individual Travel Cost Method (ITCM). In addition, this study has also estimated the consumer surplus for the two recreational sites. This study has estimated the that (i) economic value of two creational sites has estimated at the US $ 323.05 million, (ii) the consumer surplus has estimated for Nandi Hills at US$ 7.45 and Nagarhole Nationa Park at US$ 3.16. The main policy implication of the study is design 1) land use and land cover policy, 2) designing entry fees for the various protected areas for sustainable tourism and 3) achieving sustainable development goals (SDGs) at the local level.

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