

Economic Valuation of Coastal Tourism Services: A Case Study on the Mudflats

Balamurugan, S¹., Dhivya, S²., Amali Infantina, J³., Priya, P⁴., Asir Ramesh, D⁵.

National Centre for Sustainable Coastal Management,
NCSCM Rd, Anna University, Kotturpuram, Chennai, Tamil Nadu 60002, INDIA.

¹Email: balamurugan.eco@gmail.com

²Email: dhivya.meet@gmail.com

³Email: amaliinfantina@gmail.com

⁴Email: priyapsarma@gmail.com

⁵Email: asirramesh@gmail.com

ABSTRACT

The tourism sector plays a vital role in generating income and employment opportunities for the local community and bringing the foreign exchange to the country. Increased tourism revenue not only supports the conservation of resources but also supports the development of the economy and contributes to the GDP. Coastal ecosystems such as mangroves, coral reefs, and sand dunes in India attract both domestic and foreign tourists. Although mudflats offer a wide range of tourism and recreational benefits globally, their potential use in the tourism sector is highly neglected in India. Gujarat coastal stretch consists of 83.77% of total mudflat area in India among which only 0.47% mudflat area located in Dumas beach, Surat district provide significant tourism service. This study has estimated the economic value of mudflats tourism in Dumas beach by adopting individual travel cost methods. The consumer surplus estimated from the demand function suggests that mudflats in Dumas beach generated Rs. 83.79 crores in 2019. Per hectare tourism value of mudflats is estimated at Rs. 6.03 lakhs and the average mudflat patch value of tourism is estimated at Rs. 10.47 crores in 2019. The Net Present Value of mudflat tourism for 20 years period was also estimated using 3% and 5% discount rates at Rs.1248.72 crores and Rs.1044.17 crores respectively. The study suggests that raising awareness among the tourists and local community on utilising mudflats as a tourist site is a prerequisite to promote mudflat tourism. Similar mudflat locations could be identified and tourism activity could be promoted across other coastal stretches of Gujarat. Revenue generation through mudflat tourism will serve as a tool to finance the conservation costs of coastal resources.

Keywords: Mudflats, coastal tourism, travel cost method, economic value, net present value

Journal of Economic Literature (JEL) Classification Number: L830, O130, O180, Q510, Q570, R110, Z320

Mathematics Subject Classification: 91B76, 91B15, 91B18

1. INTRODUCTION

Tourism is one of the important industries in the service sector that plays a vital role in developing the economy of a country. The travel and tourism industry is the second-highest in bringing the foreign exchange to India (Joseph and Pakkeerappa, 2015). The sector generates increased income and

employment opportunities due to the multiplier effect, improves foreign exchange earnings, supports infrastructure development, and promotes national heritage and culture (UNEP, 2009; Vedapradha, et al., 2017). Coastal tourism is one of the largest segments of the tourism industry (Honey and Krantz, 2007) and the fastest growing in terms of job opportunities and economic development (Ghosh, 2011). India has a coastline of about 7,500 km, with nearly 250 million people living within 50 km from the coast. India's coastal stretch is endowed with various ecosystems such as mangroves, coral reefs, seagrasses, salt marshes, sand dunes, and mudflats. Tourism activities in these coastal ecosystems are well documented in the literature (Salam, et al., 2000; Emerton and Kekulandala, 2003; Heberling and Templeton, 2009; Dixit, et al., 2010; DebRoy and Jayaraman, 2012; Banerjee, 2014).

Mudflats are the intertidal areas consisting of soft mud and sediments (Lee and Chough, 1989). Mudflats along beaches are often perceived as a hindrance in developing tourism activities. Mudflats were also regarded as unhealthy and economically unproductive lands (Mitsch and Gosselink, 2007). In recent decades, tourism opportunities offered by mudflats are widely recognised at the global level. Recreation and tourism are popular in mudflats due to rising interests in bird watching and scenic beauty (Laffoley and Grimsditch, 2009). The mudflats in the marine protected area, Senegal, Langue de Barbarie offer nautical activities and boat tours worth the economic value of 112€/km²/year (Binet, 2015). Trampling activity as part of eco-tourism and recreation was documented in upper intertidal mudflat in South Korea (Kim, et al., 2018). The Boryeong Mud Festival is an annual festival that takes place every summer in Boryeong, South Korea. The festival consists of various recreational activities including mud baths. Various games such as mud marathon, mud wrestling, and football are conducted during the festival. Boryeong Mud Festival attracted 83,000 foreign tourists in 2008 (Park, et al., 2009) and 2.7 million total visitors with 1,83,000 foreign tourists in 2010 (Song, et al., 2012). The foreign tourist arrival for a single mudflat festival in South Korea in 2010 is about 3.17% (Ministry of Tourism, 2010) of total foreign tourist arrival in India in the same year. This shows the magnitude of potential tourism prospects of mudflats.

2. STUDY AREA

In India, mudflats are distributed in 3,55,794.02 ha of coastal land with 7,098 patches (Table 1.1). Gujarat has the highest distribution of mudflats consisting of 83.77% of total mudflats of India followed by Tamil Nadu (5.32%) and West Bengal (3.69%). Although many studies exist on coastal tourism of Indian states, no study was found on tourism/recreational activities in mudflats in particular. Dixit, et al., (2016) estimated the tourism value of coastal ecosystems in Little Rann of Kachchh, Gujarat in which mudflats were also studied along with other ecosystems in LRK. But no economic values were estimated for the mudflats' tourism service alone.

Gujarat has the second-longest coastline in India (Rajawat, et al, 2015; IRADe 2017) next to Andaman and Nicobar Islands. Mudflats are distributed across 13 coastal districts of Gujarat (Table 2.1). Yet, Dumas beach in Surat district is the only place where mudflats are found to be utilised for tourism activity at a significant level.

Table 2.1 Mudflats Distribution in the Indian Coastal States

Sl. No	State/Union Territory	No. of Mudflat Patches	Mudflat Distribution (ha.)
1	Gujarat	4127	2,98,062.50
2	Maharashtra	209	4,695.60
3	Goa	23	105.17
4	Karnataka	92	81.07
5	Tamil Nadu	519	18,943.45
6	Andhra Pradesh	61	713.45
7	Odisha	351	7,475.47
8	West Bengal	1,299	13,134.30
9	Diu & Daman	8	187.67
10	Puducherry	14	4.69
11	Andaman & Nicobar Islands	395	12,390.65
Total		7098	3,55,794.02

Source: NCSCM unpublished data

Table 2.2 Mudflats Distribution in Coastal Districts of Gujarat

Sl. No	Coastal Districts of Gujarat	Number of Mudflat Patches	Mudflat distribution - ha.
1.	Ahmadabad	43	13,621.69
2.	Amreli	17	120.93
3.	Anand	27	16,374.25
4.	Bharuch	114	28,529.65
5.	Bhavnagar	137	15,449.04
6.	Gir Somnath	12	417.86
7.	Jamnagar	353	26,162.20
8.	Kachchh	1,651	71,872.10
9.	Morvi	605	11,170.93
10.	Navsari	15	322.12
11.	Rann of Kachchh	1,013	99,834.44
12.	Surat	31	6,339.86
13.	Valsad	15	842.84
Total		4,127	2,98,062.5

Source: NCSCM unpublished data

Dumas beach is located 21 kilometres away from Surat city. It is famous for its scenic beauty and delicious food options (Patel and Padhya, 2020). Mudflats are distributed in 8 patches across 1,390.25

ha. of land alongside the beach. The place offers scenic beauty, seasonal migratory bird watching, mud walk, horse ride, and camel ride options to the tourists. Since Dumas is a famous urban beach in Surat city, it attracts a high number of local tourists.

3. MATERIALS AND METHODS

Following Dixit et al (2016), the Individual travel cost method was adopted to estimate the economic value of tourism in the mudflats of Dumas beach. The travel cost method expresses the revealed preference of tourists to derive tourism, education, and economic values from the site (Chopra, 2004). The travel cost incurred by the tourist to visit the study site is considered as the surrogate value of tourism service provided by the study site. In Dumas beach, 56 tourists were interviewed during the field visit in April 2019 to assess their travel costs. Since the study assumes that the tourists made expenditures to visit only the study site, tourists were asked if they visit other sites as well during their trip. Data on age, education, occupation, income, place of origin, mode of travel, cost of travel and days spent, level of satisfaction, and purpose of site visit were collected from the respondents. The opportunity cost of the time spent was also included based on the per capita household income of tourists.

The individual travel cost method is based on the demand function of an individual's annual visits to the site and the costs incurred on these visits. Following Torres-Ortega, et al (2018), the demand function was used to estimate the individual travel cost which can be expressed as;

$$V_i = f(TC_i, X_i) + e_i \dots\dots\dots (1)$$

Where,

V_i = number of visits of a tourist in a year

TC_i = total cost of travel to the site including the opportunity cost of time

X_i = vector of additional characteristics such as age, gender, income, and location

e_i = error term.

The coefficient of travel cost derived from the demand function helps to estimate the consumer surplus for every individual. Individual consumer surplus is calculated by using the following formula (Willis and Garrod, 1991; Twerefou and Ababio, 2012).

$$CS = -1/\beta_{ij} \dots\dots\dots (2)$$

Where,

CS = Consumer surplus per person per trip

β_{ij} = Coefficient of travel cost.

The total annual consumer surplus obtained from tourism activity at the study site was calculated following Mohammed El-Bekkay, et al (2013). This total consumer surplus represents the economic value derived from tourism services of mudflats in the assessment year.

$$TV = CS (Vn_y) \dots\dots\dots (3)$$

Where,

TV = Tourism Value of Mudflats

CS = Consumer Surplus per person per trip

Vn_y = Number of Visits in the year 2019

The average footfall was taken from the range of tourist footfall documented by Patel and Padhya, (2020) i.e., in weekdays 1000 to 2000 and on weekends 3000 to 5000 which was analogous to the data collected from the field.

Since mudflats provide tourism benefits for a longer period of time (Delang and Ling, 2008), the Net Present Value (NPV) of mudflat tourism has been estimated for 20 years with 3% and 5% discount rates. NPV presents the value of all future cash flows at current prices to support policy decisions. Following Malik, et al (2015), the formula to estimate the net present value is represented as;

$$NPV = \sum_{i=1}^n \frac{Bit - Cit}{(1+r)^t} \dots\dots\dots (4)$$

Where,

NPV = Net present value

B = Annual gross benefit,

C = Annual gross cost

r = Discount rate

i = Benefit or cost

t = Period of time

The cost incurred on conserving and providing tourism service in Mudflats of Dumas beach is assumed to be nil. Hence estimated benefit value estimated is discounted appropriately for 20 years period of time.

4. ANALYSIS AND DISCUSSION

General characteristics of sample respondents have been presented in table 4.1. The sample size covers 73% male and 27% female respondents. The average age of sample respondents was 36.6 with the range from 22 to 60 years old. 73.2% of tourists are from local areas who visit the beach in one day. Only the regional and foreign tourists stay at the tourist site for 1 to 3 days. A tourist spends 1.21 days on average in the mudflats of Dumas beach. The majority of tourists (53.57%) visit mudflats occasionally (2 to 4 times a year).

Table 4.1 General Characteristics of Sample Tourists

	Sample Size	Sex		Average Age	Origin Place			Visit rate		
		Male	Female		Local	Regional	Foreigners	Rare	Occasional	Frequent
N	56	41	15	36.6	41	13	2	15	30	11
%		73.21	26.79		73.2	23.2	3.6	26.79	53.57	19.64

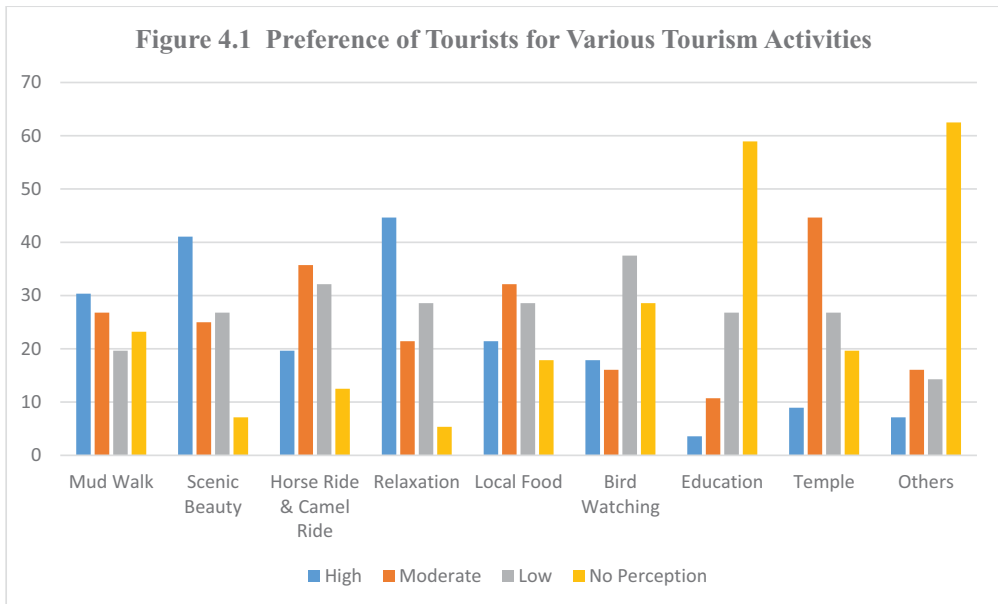
Source: Computed from primary data, 2019

An analysis of the preferences of tourists suggests that 44.64% of tourists prefer to visit mudflats mainly for relaxation purposes and 41.07% of tourists for scenic beauty (Table 4.2 and Figure 4.1). Mud walk is the third most preferred activity of tourists (30.36%). Dariya Ganesh Temple located in the mudflat area is also a source of attracting visitors (Prajapati, et al, 2017).

Table 4.2 Preference of Tourists for Various Tourism Activities

Activities	% of Total Respondents			
	High	Moderate	Low	No Perception
Mud Walk	30.36	26.79	19.64	23.21
Scenic Beauty	41.07	25.00	26.79	7.14
Horse Ride & Camel Ride	19.64	35.72	32.14	12.50
Relaxation	44.64	21.43	28.57	5.36
Local Food	21.43	32.14	28.57	17.86
Bird Watching	17.86	16.07	37.50	28.57
Education	3.57	10.71	26.79	58.93
Temple	8.93	44.64	26.79	19.64
Others	7.14	16.07	14.29	62.50

Source: Computed from primary data, 2019



Tourists also visit mudflats to enjoy horse and camel rides, tasty local foods, and watching migratory birds. Among the sample respondents, 58.93% responded that they have no perception towards education benefits offered by mudflats and 37.5% responded that they have preferred to visit the beach for other activities such as photography and hanging out with friends. The foreign tourists have responded that the prevailing myth about Dumas beach being a haunted place has attracted them to visit the site.

Table 4.3 Coefficient Value Estimation for Travel Cost

Independent Variables	Regression Coefficients	Standard Error	't' value	Sig.
Constant	4.161432	0.619	6.716	0.032
Travel cost	-0.226	0.037	-6.696	0.000
Age	-0.050	0.011	-3.185	0.002
Gender	0.861	0.239	1.845	0.073
Location	-1.102	0.281	-3.910	0.000
Education	0.159	0.103	1.551	0.027
Income	0.177	0.134	1.327	0.091
N = 56, R ² = 0.56				

The demand function for mudflats tourism in Dumas beach following equation 1 is estimated as;

$$V_i = \alpha - \beta_1 (\text{Travel cost}) - \beta_2 (\text{Age}) + \beta_3 (\text{Gender}) - \beta_4 (\text{Location}) + \beta_5 (\text{Education}) + \beta_6 (\text{Income})$$

Where,

V_i = Number of visits

α = Constant

β = Coefficient of independent variables

The result supports the demand theory with respect to travel cost and the number of trips made by tourists to mudflats. The variables such as travel cost, age, and location have an inverse relationship with the number of trips made to mudflats whereas gender, education, and income have a positive relationship with the number of trips. This means that the number of visits increases with an increase in education and income and decreases with an increase in travel cost, age, and distance from the origin location. Male respondents make more visits than female respondents. The travel cost includes both the actual cost spent during the visit and the opportunity cost of time. The opportunity cost of time refers to the cost associated with the time spent during the visit. For example, tourists might have lost their man-days and associated income for the time they spent during the visit. Since the tourists are willing to forego their income for a particular period during the visit, the opportunity costs incurred also constitute a value to the tourism service of mudflats.

Table 4.4 Net Present Value of Mudflats Tourism

Net Annual Benefit (2019)	NPV for 20 Years	
	3% Discount Rate	5% Discount Rate
Rs. 83,78,66,688	Rs. 1248,72,38,389	Rs. 1044,16,70,905

Based on equation (2), individual consumer surplus is estimated at Rs. 1,074.06. Converting this value to the total number of tourists in 2019 following equation (3), the economic value of mudflats tourism is estimated to be Rs. 83,78,66,688 in 2019. Per hectare value of mudflats tourism is estimated at Rs. 6.03 lakhs and the average mudflat patch value of tourism is estimated at Rs. 10.47 crores in 2019.

Net Present Value (NPV) of mudflats tourism for the period of 20 years is shown in table 4.4. Since mudflat tourism has a non-consumptive use-value, no social cost was assumed to be incurred in the study site.

Discounting is a procedure to give present value to the future benefits expected to be received. It is estimated that tourism service from mudflats offers the NPV of Rs. 1248.72 Crores at 3% discount rate and Rs. 1044.17 Crores at a 5% discount rate for the period of 20 years.

5. CONCLUSION

The study suggests that mudflat tourism has the potential to create employment opportunities and enhance the livelihood of the local community. Mudflats in India can be considered for generating funds for conservation through promoting tourism activities. Economic development in coastal areas serves as a tool to finance the conservation costs and thereby to maintain sustainability. Creating awareness among the tourists and local community on utilising mudflat as a tourist site in an eco-friendly manner is a prerequisite to promote mudflat tourism. Mudflats located near the beaches have the potential of attracting tourists since they can be easily reached. Hence, those areas have to be identified and tourism infrastructure has to be developed in tourism potential sites to achieve economic benefits in the long run. The possibility of conducting a mudflat funfair/carnival festival could be explored which might attract a large number of tourists from different countries, thereby bringing in foreign exchange to India.

Acknowledgment

The authors express their gratitude to the Ministry of Environment Forests and Climate Change, New Delhi and the World Bank, New Delhi for their continuous support in the capacity development activities of coastal management in India. The authors thank the experts for their valuable suggestions and comments on this study, especially, Dr. Ramesh Ramachandran, Director, National Centre for Sustainable Coastal Management (NCSCM), Dr. Purvaja Ramachandran, Division Chair, NCSCM, Shri. Tapas Paul and Shri. Ramakrishna, the World Bank, New Delhi for their guidance and encouragement. The authors also thank the colleagues at various divisions of NCSCM for their timely support at various levels of the research process.

6. REFERENCES

- Banerjee, M. (2014). ECO Tourism in Sunderbans: A Life Line for Local People and the Ecology. *International Journal of Science and Research*, 3(11).
- Binet, T. (2015). *Valuing net benefits of biodiversity conservation in West African marine protected areas* (Doctoral dissertation, University of Portsmouth), United Kingdom.

- Chopra, K. (2004). Economic valuation of biodiversity: the case of Keoladeo National Park. In: Kadekodi, G.K., Ed., *Environmental Economics in Practice: Case Studies from India*, Oxford University Press, New Delhi, Oxford, and New York, 86-121.
- DebRoy, P., & Jayaraman, R. (2012). Economic valuation of mangroves for assessing the livelihood of fisherfolk: a case study in India.
- Delang, C. O., & Ling, T. Y. (2008). Managing wetlands: an ecological economic analysis of the Hong Kong Wetland Park. *Ecological Economy*, 4(4), 440-453.
- Dixit, A.M., Bandyopadhyaya, S., Kumar, L., & Bedamatta, S. (2016). Economic valuation of landscape level wetland ecosystem and its services in Little Rann of Kachchh, Gujarat. The Economics of Ecosystems and Biodiversity India Initiative. GIZ India. pp. 160.
- Dixit, A. M., Kumar, P., Kumar, L., Pathak, K. D., & Patel, M. I. (2010). Economic Valuation of Coral Reef Systems in Gulf of Kachchh. Final Report. World Bank Aided Integrated Coastal Zone Management (ICZM) Project. Submitted to Gujarat Ecology Commission. 158 pp.
- Emerton, L., & Kekulandala, B. (2003). Assessment of the Economic Value of Muthurajawela Wetland. *Occasional Paper*, IUCN, Sri Lanka.
- Ghosh, T. (2011). Coastal tourism: Opportunity and sustainability. *Journal of Sustainable Development*, 4(6), 67.
- Heberling, M. T., & Templeton, J. J. (2009). Estimating the economic value of national parks with count data models using on-site, secondary data: the case of the Great Sand Dunes National Park and Preserve. *Environmental Management*, 43(4), 619-627.
- Honey, M., & Krantz, D. (2007). *Global trends in coastal tourism*. Center on Ecotourism and Sustainable Development.
- IRADe (2017). Review of status of Marine National Park, Jamnagar & evolving vision statement for management of MNP. Integrated Research and Action for Development, New Delhi.
- Joseph, P. D., & Pakkeerappa, P. (2015). Sustainable coastal tourism: A community perspective. *Atna Journal of Tourism Studies*, 10(1), 23-33.
- Kim, T. W., Kim, S., & Lee, J. A. (2018). Effect of mudflat trampling on activity of intertidal crabs. *Ocean Science Journal*, 53(1), 101-106.
- Laffoley, D., & Grimsditch, G. D. (Eds.). (2009). *The management of natural coastal carbon sinks*. IUCN, Gland, Switzerland. 53 pp
- Lee, H., and Chough, S. (1989), 'Sediment distribution, dispersal and budget in the Yellow Sea', *Marine Geology*, Vol 87, pp 195–205.
- Malik, A., Fensholt, R., & Mertz, O. (2015). Economic valuation of mangroves for comparison with commercial aquaculture in South Sulawesi, Indonesia. *Forests*, 6(9), 3028-3044.
- Ministry of Tourism (2010). India Tourism Statistics 2010, Government of India.
- Mitsch, W., and Gosselink, J. (2007). *Wetlands*, John Wiley & Sons, New York.
- Mohammed El-Bekkey, Abedellatif Moukrim and Faical Benchakroun (2013). An economic assessment of the Ramsar site of Massa (Morocco) with travel cost and contingent valuation methods, *African Journal of Environmental Science and Technology*, Vol. 7(6), pp. 441-447.
- Park, S. H., Mun, K. N., & Park, Y. W. (2009). A Study on the evaluation of Boryeong cultural tourism festival between Korean and foreign visitors. *Hospitality Administration*, 18(5).
- Patel, K. A., & Padhya, H. J. (2020). Sustainable tourism planning for a coastal region: A case study of Dumas in Gujarat state in western India. *IJRAR-International Journal of Research and Analytical Reviews (IJRAR)*, 7(1), 798-801.

Prajapati, G., Prajapati, R., Raval, H., & Patel, D. M. (2017). A Review on: Resilience of Tsunami by Mangrove Belt in Surat City. *International Journal for Innovative Research in Science & Technology*, 3(9), 36-39.

Rajawat, A.S., Chauhan, H.B., Ratheesh, R., Rode, S., Bhandari, R.J., Mahapatra, M., Kumar, M. Yadav, R., Abraham, S.P., Singh, S.S., Keshri, K.N. and Ajai (2015). Assessment of coastal erosion along the Indian coast on 1: 25,000 scale using satellite data of 1989–1991 and 2004–2006 time frames. *Current Science*, 109 (2), pp 347-353.

Salam, M. A., Lindsay, G. R., & BEVERIDGE, M. C. (2000). Eco-tourism to protect the reserve mangrove forest the Sundarbans and its flora and fauna. *Anatolia*, 11(1), 56-66.

Song, H. J., Lee, C. K., Kang, S. K., & Boo, S. J. (2012). The effect of environmentally friendly perceptions on festival visitors' decision-making process using an extended model of goal-directed behavior. *Tourism Management*, 33(6), 1417-1428.

Torres-Ortega, S., Pérez-Álvarez, R., Díaz-Simal, P., Luis-Ruiz, D., Manuel, J., & Piña-García, F. (2018). Economic valuation of cultural heritage: Application of travel cost method to the national museum and research center of altamira. *Sustainability*, 10(7), 2550.

Twerefou, D. K., & Ababio, D. K. A. (2012). An economic valuation of the Kakum National Park: An individual travel cost approach. *African Journal of Environmental Science and Technology*, 6(4).

UNEP, (2009). *Sustainable Coastal Tourism: An integrated planning and management approach*, United Nations Environment Programme, 2009.

Vedapradha, R., Hariharan, R., & Niha, A. (2017). Indian tourism industry—a yardstick to GDP. *European Journal of Tourism, Hospitality and Recreation*, 8(2), 140-146.

Willis, K.G. and Garrod, G.D. (1991). An Individual Travel Cost Method of Evaluating Forest Recreation, *Journal of Agricultural Economics*, 42, 33-42.