



## Economic Valuation of Recreation at Lengwe National Park in Malawi

Walison Fixon<sup>1</sup> and PhiriInnocent Pangapanga<sup>2\*</sup>

<sup>1</sup>Department of Environmental Sciences and Management, Natural Resource Management Expert, Lilongwe University of Agriculture and Natural Resources, Lilongwe, Malawi.

<sup>2</sup>Department of Environmental Sciences and Management, Agricultural, Environment and Natural Resource Economist, Faculty of Natural Resources, Lilongwe University of Agriculture and Natural Resources, Bunda College of Agriculture, Lilongwe, Malawi.

### Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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### ABSTRACT

**Aim:** We estimate the recreation value of Lengwe National Park (LNP) in Malawi using the travel cost method (TCM). The TCM is one of the techniques used for estimating economic values of environmental goods and services that do not command a market price such as National Parks.

**Study Design:** The study adopts a purposive sampling procedure.

**Place and Duration:** Lengwe National Park, Chikwawa in Southern Malawi. The study was implemented between September and December 2015.

**Research Methodology:** The study administers about 670 questionnaires to recreationists. The data were subjected to a Travel Cost Analysis to assess the socio-economic factors that affect visitation at Lengwe National Park and to estimate its recreation value.

**Results:** The study finds an opposite but anticipated relationship between total travelling costs and individual visits per year. On the other hand, we discover direct relationship between individuals' income and visits per year. In this study, an individual average round trip costs approximately MWK92, 440. The individual consumer surplus (recreation value) per visit is MWK81, 037 and the total annual recreation value for Lengwe National Park is MWK94, 003,241.

\*Corresponding author: E-mail: [phiriinnocent@gmail.com](mailto:phiriinnocent@gmail.com);

**Conclusion:** We conclude that the Travel Cost Method can be used to evaluate recreation sites in Malawi. We find travel costs and income as socioeconomic factors affecting visitation at Lengwe National Park and the total annual recreation value of the park is estimated to be MWK94, 003,241. These results may be used in the management of the park and related areas. We further recommend that management should re-introduce more game and protect the animals to enable the park withstand competition for visitors with other protected areas within Malawi. The study further highlights the need to set entry fees based on the number of days the clients stay in the national park.

*Keywords: Recreation; travel cost method; consumer surplus; Lengwe National Park; Malawi; Malawian Kwacha (MWK).*

## 1. INTRODUCTION

Protected areas are widely regarded as the cornerstones of biodiversity conservation strategies worldwide providing the main foundation for *in situ* conservation of flora and fauna according to Common and Stagl [1]. They also provide ecosystem services to the public in addition to being places for humans' recreation which attract tourists from different destinations, McNeely [2]. Despite contributing to human welfare, Tourism is an important economic activity in most countries and one of the largest and fastest growing sectors of the world's economy according to the World Travel and Tourism Council-WTTC [3]. As stated by Hudman and Hawkins [4], tourism and leisure promote peaceful co-existence and happiness of the individuals in the society.

In Malawi, tourism is overwhelmingly nature-based and contributes 2.7 percent to its Gross Domestic Product (GDP) as reported by Government of Malawi [5]. The country is endowed with a variety of recreation sites which include lakes and beaches, mountains, and wildlife reserves. Malawi's wildlife reserves comprise of five national parks, four game reserves, and three key nature sanctuaries. Among the national parks, Lengwe is one of the sites where tourists go for recreation. According to Kalima [6] in an analysis of visitor's data for Lengwe National Park (LNP) from July 2012 to June 2013, the park registered a total of 1,122 paying visitors of which 618 were Malawians. In the same year, a total of 2,424 non-paying visitors was recorded of which 92 percent were education visitors. The report also indicated that the number of visitors decreased in the rain season and increased in the dry season.

Lengwe national park holds a wide range of biodiversity and other resources essential for aesthetic, cultural, and social values. However,

the economic value of all these services is not comprehensively quantified. This brings problems as the recreation value of the park is normally under estimated and the application of conservation measures becomes problematic since it is difficult to determine how much to invest. The park receives international and local visitors each year for recreation and the visitors make enormous sacrifices in terms of travelling costs, forgone time, and other associated expenses. Owing to these enormous sacrifices that the visitors make to the park, it is evident that the park has a substantial recreation value. While marketable goods and services are valued in terms of their prices, non-market goods and services such as recreation sites and other environmental amenities such as clean air could be hard to value as they do not command a market price.

Over the past years, most economics have heralded the TCM as the best valuation tool for evaluating recreation sites and events since the technique relies on the revealed preference of visitors see Curtis [7] and Nde [8]. As a consequence, the technique has been widely used by environmental economists and researchers in the past decades to value varying recreational activities, Anderson [9].

In a study by Limaei et al. [10] on economic valuation of natural forest park (Masouleh forest park) north of Iran, travel cost method was used where results showed that increasing the travel time, the number of visitors decreased and when the travel costs increased, the number of visitors decreased. The results also indicated that the willingness to pay decreased by increasing the entrance fee. The study recommended for improvements in provision of more facilities and services based on the demands of different groups of people who visited the park.

From Turkey, Ortaçefime et al. [11] applied the Individual Travel Cost Method (ITCM) to study

the recreation use value of Kursunlu Waterfall Park in the Antalya province. For this purpose, 500 on-site questionnaires were administered between September 1998 and June 1999 where results showed that Kursunlu waterfall Nature Park has an annual recreation value of US\$50,000 per year with July 1999 exchange rates. The study concluded that the ITCM can be used in the estimation of recreation use value of the natural areas in turkey but further research on the type of costs to be considered in calculations of travel costs was needed.

Another study by Larkin [12], the Travel Cost Method (TCM) and Contingent Valuation Method (CVM) were used to derive estimates of economic value for recreation use of Los Nevados National Park (LNNP) in the Andean region of Colombia. The TCM results showed that estimates of total economic value for the trips to LNNP ranged between 1.1 Million US\$ and 4.6 Million US\$ per seven months. Because the consumer surplus was found to be high relative to the budget of Colombian park service, the study recommended for continued funding to the parks. For the WTP part, most respondents regarded that wildfires are arguably a natural component of the disturbance regimes that maintain the integrity of the ecosystem hence believed that high entrance fee was not an option. This is interesting and not surprising as the individuals were expressing their non-market environmental preferences.

In Tanzania, Musamba et al. [13] carried out a study where they evaluated the recreation value of Lake Victoria in Musoma Municipality. Among others, the study estimated the consumers' surplus to be Tsh. 1,462,664,555 (US\$1,044,760) per annum. From the results, it was recommended that policy formulation and project implementation should consider the use and non-use values of Lake Victoria to estimate the social welfare gain or loss with respect to the proposed policy or project. Still in Tanzania, Winkle [14] used the ITCM to estimate the recreation benefits of Tanzanians protected areas to East African citizens where among others found that visits per year had a significant relationship with travel costs but not with education and income. The annual recreation value or consumer surplus of ANP was found to be \$0.9-\$2.7 Million which showed that national parks provide a significant source of revenue and social utility to the public hence should not be undervalued. Further, it was recommended that the results will inform government officials

making decisions about economic development and environmental protection in Tanzania.

Owing to these studies, it shows that non-market valuation has become an important tool for understanding how the public values environmental goods and services that do not command a market price. On the same, it is evident that the results provide baseline information where decisions for management and policy formulation are based.

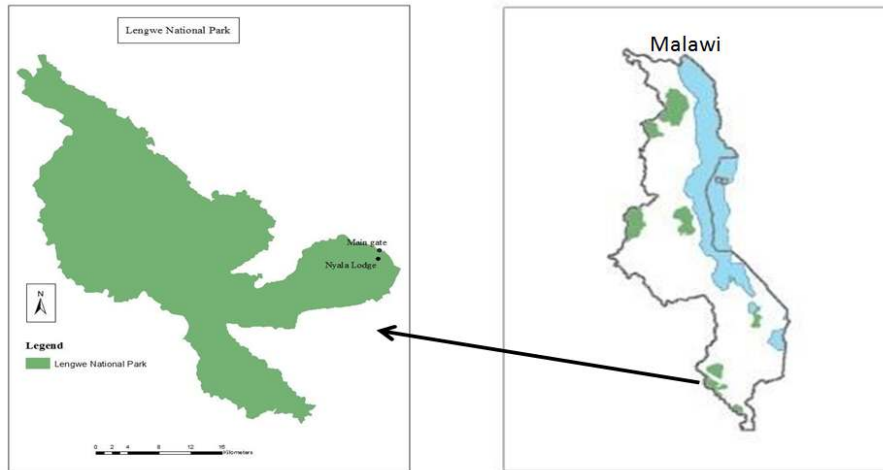
Although much research has been done to estimate the economic values of environmental goods and services in other countries, little efforts have been made in the light of valuing these resources in developing countries like Malawi to date. Therefore, this study will help to inform the park managers, stakeholders, and the public about the recreation value of LNP and its contribution to the national economy through tourism. Understanding the recreation value of the protected area will also help park managers, government officials, and investors on making decisions about how much to invest on the facilities and maintenance of the park or how much to spend on environmental protection. The study also reveals some areas that require improvements for the benefits of the park and the visitors. This will promote efficiency in managing the park and contribute to policy formulation.

## **2. MATERIALS AND METHODS**

### **2.1 Study Area**

This study was conducted at Lengwe national park located in the southern region of Malawi, along Shire valley in Chikwawa district at the southern end of the great African rift valley and borders to the west with Mozambique. It lies at an altitude approximately 100 meters above the sea level. It was first set aside in 1928 as a game reserve and was given a national park status in 1970. At that time, it covered an area of 104 km<sup>2</sup> then in 1975 it was extended to 887 km<sup>2</sup> see Government of Malawi [5].

LNP is a semi-arid area and receives average annual rainfall of 835 mm and temperatures sometimes reach 43°C in the hot season. The natural vegetation of the area is mixed woodland of miombo and mopane and comprise of grassy dambos. The park is probably famed for the Nyala antelope which drove its establishment as it is not naturally found in other northern parks.



**Fig. 1. Map of Malawi showing Lengwe National park**

Accommodation facilities are available at Nyala Lodge 1.5 km from the main gate and is run by Jambo Africa. According to secondary data for LNP visitation between 2012 and 2015, it receives an average of 3,053 visitors per year of which 62% are education visitors and senior government officials while the rest are recreation visitors.

## 2.2 Questionnaire Design and Data Collection

Individual travel cost method was used where a questionnaire was designed to capture necessary information for the Travel Cost Method study. It began with an informed consent statement that had information on the objective of the study, assurance of confidentiality, and arousing of the interviewees interest.

On the travelling cost information which represent the use values, the questions asked included the visitors` destination, mode of transport, transport expenses, entry fees, total time planned for the trip as well as onsite expenses such as food and accommodation. Thereafter, there were questions relating to visitor`s opinion to suggest what should be improved in the park to make it more interesting. Finally, the visitors were asked to reveal their socio-economic information such as age, gender, education level, job status, monthly average income and nationality.

The onsite survey for this study was conducted between September and December 2015 where 670 questionnaires were administered to the

visitors through face-to-face interviews. The questionnaire was first pretested in the first week of September 2015 and this helped to have some questions on transport expenses and willingness to pay been reworded. During full administration, the visitors were met at the main gate and at Nyala lodge. Since it was impossible to meet all visitors, systematic random sampling was implemented in the survey as it was easier to perform in the field and less subject to selection errors by the interviewer.

Although questions were read to some respondents, some opted to read and answer the questions themselves as most of them could easily understand them and it took 10 to 15 minutes to complete the questionnaire. Some of the challenges met during data collection were that some visitors who opted to fill the questionnaire on their own could go without returning and some were refusing to answer questions saying they were in hurry.

Secondary data about the visitors to the park was obtained from the visitors` book at the main gate and from compiled reports at research and monitoring section of the park.

## 2.3 Data Analysis

The total economic value of a recreation site is estimated as a function of use values related in consuming or enjoying an environmental good or service according to Tietenberg and Lewis [15]. This is represented mathematically as:

$$V_{LNP} = f(\alpha, \beta, X, \epsilon) \quad (1)$$

In equation (1),  $V_{LNP}$  represents total economic value of recreation at Lengwe National Park (LNP),  $\alpha$  and  $\beta$  are unknown parameters estimated by the equation,  $X$  is a bundle of variables influencing  $V$ , and  $\varepsilon$  represents unobserved variables by the researcher that may probably have an effect on the total economic value. In this study,  $X$  includes the variables such as transport costs, entry fees, and onsite expenditures.

Following Hanley and Spash [16], equation (2) is used to estimate the total individual travel costs as represented below:

$$\Pi_{(ij)} = \alpha_0 + \beta_1 D_{ij} + \beta_2 F_j + \beta_3 S_{ij} + \varepsilon_{ij} \quad (2)$$

Where  $\Pi_{(ij)}$  is the total cost of individual  $i$  to visit site  $j$ ,  $D_{ij}$  is the distance costs for each individual  $i$  dependent on the distance the person has to travel to site  $j$ ,  $F_j$  is the entry fee to the site  $j$ ,  $S_{ij}$  is the onsite expenditures for individual  $i$  at site  $j$ , and  $\varepsilon_{ij}$  represents unobserved costs of individual  $i$  visiting site  $j$ .

For further analysis, data were entered, cleaned, processed and regressed in Statistical Package for Social Sciences (SPSS) version 20. Regression analysis assessed socioeconomic factors that may affect visitation of an individual to the park  $U_{ij}$  such as travelling costs  $\Pi_{ij}$ , age  $W_{ij}$ , income  $Y_{ij}$ , education level  $E_{ij}$  and unobserved factors  $\varepsilon_{ij}$  against number of annual visits as a dependent variable. This gives the demand function of the park as shown in the equation (3):

$$U_{ij} = \alpha_0 + \beta_1 \Pi_{ij} + \beta_2 W_{ij} + \beta_3 Y_{ij} + \beta_4 E_{ij} + \varepsilon_{ij} \quad (3)$$

From the demand function as used by Winkle [14], Blackwell [17], and Ortaçefime et al. [11]; the consumer surplus is estimated using expression (4):

$$CS = 1/_{-\lambda} \quad (4)$$

Where  $CS$  is the consumer surplus and  $\lambda$  is the curve of the demand function (travel cost coefficient). To get the total consumer surplus (TCS) of the park, the value obtained from above is multiplied by the total annual population of visitors to the park. The consumer surplus represents the recreation use value of the park.

The data were also subjected to descriptive statistics such as means, frequencies, and percentages.

### 3. RESULTS AND DISCUSSION

#### 3.1 Socioeconomic Characteristics of the Recreationists

As shown in Table 1 most of the visitors at LNP were aged between 31 and 40 (37%) followed by those between 41 and 50 (27%), then above 50 (24%) and lastly between 21 and 30 (12%). This means that people aged between 31 and 50 are more interested in visiting the park as they contributed much of the visitors. The results are almost similar to what Limaie et al. [10] got at Masouleh forest park in Iran that visitors of ages 31 – 40 ranked first (31.25%) followed by 41 – 50 (30.20%) then 15 – 30 (22.91%) and the rest were above 50 years.

From Fig. 2 the observations showed that the park receives more male visitors (67%) than females (33%). This is in line with what Limaie et al. [10] got in Iran where 76% of visitors to Masouleh forest park were men. Similar results were also obtained by Sandram [18] in Malawi and Winkle [14] in Tanzania where men contributed 65.5% and 68% of the visitors to Malingunde dam and Arusha NP respectively. This implies that males are more interested in visiting recreation areas than females.

In terms of educational level, 51% of the sampled visitors at LNP attended university education and the trend decreased towards lower levels as shown in Table 2. In similar studies such as those of Ortaçefime et al. [11], Limaie et al. [10], and Tang [19]; it was again found that visitors with university degrees were the highest in numbers for visiting recreation sites. This is an indication that there is a direct relationship between education level and number of visitors to the park. The reason for this trend might be that people with higher education realize the benefits of environmental goods and services and they also have the capacity to travel to these areas.

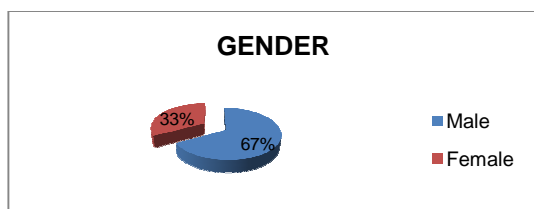
Considering that income is among the factors that contribute to one's ability to visit recreation sites, the descriptive results showed that the number of visitors increased with average monthly income. This has been shown in Fig. 3 where 57% of the visitors had an average monthly income of greater than MWK200,000 as compared to those with less income.

This means that income matters most for visitors to cater for travelling costs from their destinations to the site. On the same, it is evidenced by the fact that 83.6% of the visitors sampled during the survey travelled using private or own vehicles.

The employment status information shown in Table 3, it reveals that 73% of the sampled visitors were employed while 18% had own business. The results on employment status are not far from what Tang [19] found that 64% of the sampled visitors at Yuelu Mountain Park in China were employed. On the other hand, Limaie et al. [10] found that 41.66% of the visitors to Masouleh forest park in Iran were employed while 39.6% were business people and the rest were retired and students. This is an indication that employment status determines individuals' economic status which in turn enables him/her to visit recreation sites.

**Table 1. Ages of sampled visitors at LNP**

Age group	Frequency	Relative frequency (%)
12-20	0	0
21-30	81	12
31-40	252	37
41-50	179	27
Above 50	158	24

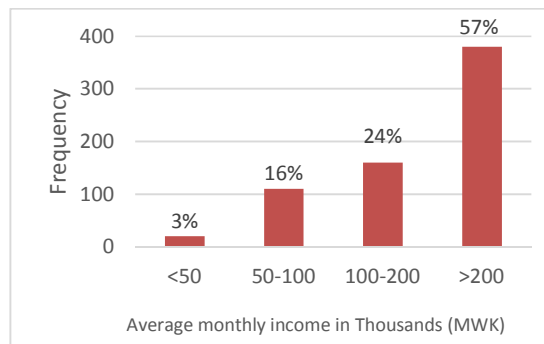


**Fig. 2. A pie chart showing the proportion of male to female visitors at LNP**

### 3.2 Visitors' Opinion

In addition to gathering socio-economic information on park visitors, the study asked respondents to comment on the condition of the park. Based on this, 89.6% of the visitors agreed that they were happy by the quietness, natural beauty, and wilderness of the park. However, most visitors complained of scarcity of animals in the park. This might affect LNP in withstanding competition with other protected areas in Chikwawa such as Nyala Park which have significant animal numbers and Majete game reserve which is now hosting the Big Five. Apart from animal scarcity, visitors also complained of

poor access roads within the park especially during rainy season as they become muddy and impassable.



**Fig. 3. A graph showing monthly average income of the sampled visitors at LNP**

**Table 2. Education level of sampled visitors at LNP**

Education level	Frequency	Relative frequency (%)
Primary	0	0
Junior secondary	0	0
Senior secondary	79	12
Profession certificate or diploma education	248	37
University degree	343	51

**Table 3. Employment status of visitors at LNP**

Employment status	Frequency	Relative frequency (%)
Employed	490	73
Own business	121	18
Retired	39	6
Student	10	1
Unemployed	10	1

### 3.3 Travelling Costs

#### 3.3.1 The transport (distance) cost

Out of the 670 respondents, 83.6% reported to have used private or own vehicles while the rest used public transport. For those who used private or hired vehicles, the amount of money paid on fuel was considered as their transport cost or alternatively the amount of fuel used to travel to the site. However, if the visitors come as a group in one vehicle, the reported transport expense was divided by the number of the team to obtain individual cost. To visitors who used

public transport, the amount paid to reach LNP was considered.

Therefore, the average round trip transport cost for an individual at LNP was estimated to be MWK23,379.94.

### **3.3.2 Entry fee**

The entry (access) fee included person fee, vehicle fee, and guiding fee.

In terms of vehicle fee, it was 3US\$ per day whether a Malawian or not and the guiding fee was 10US\$ per day regardless of type of visitor or group size. From the sampled visitors, the total individual entry fee was averaged at MK5,005.44

**Table 4. Individual rates of paying visitors at LNP during survey period**

Type of visitor	Rate (per day)
Malawian	3US\$ (MWK1,650)
Resident foreigner	7US\$ (MWK3,850)
Non-resident foreigner	10US\$ (MWK5,500)

However, it was observed during data collection that most visitors who stay in the park for more than a day do not pay for the subsequent days of their stay in the park and this might be one of the reason why the park realize little revenue from tourists.

### **3.3.3 Onsite expenditures**

Expenditures that are incurred onsite include food, drinks, accommodation, camping, and other costs within their stay in the park which gave an average of MWK64,055.18. From the study, it was realized that onsite expenditures were high as compared to transport and entry fees and one of the factors being high accommodation charges at Nyala Lodge which is the only service provider within the park. Table 5 shows accommodation charges at Nyala Lodge.

**Table 5. Accommodation prices at Nyala Lodge in LNP during the survey period**

Service	Price per night
Full board (double/twin)	220 US\$
Full board (single)	137.50 US\$
Bed + breakfast (double/twin)	125.50 US\$
Bed + breakfast (single)	90 US\$

It was also interesting to note that visitors have to book for accommodation in advance as the lodge is always full especially during weekends and festivals. Again, the prices offered are not affordable to local people and this might affect visitation to the park.

### **3.3.4 Individual total travelling costs**

As presented by equation 2 under empirical framework, Individual total travel cost was estimated to be MWK92,440.56 after adding average individual transport expenditure, entry fee, and onsite expenditures.

However, the study failed to include the opportunity cost of travelling time as some studies do. Among the reasons, it was difficult to calculate according to local situation since literature does not provide one standard. While some researchers such as Hanley and Spash [16] opted for an hourly wage rate, others including Nde [8] argued for a fraction of the hourly rate. Generally, the fraction could range anywhere from zero to one and different researchers have tackled this concern in different ways. In our case again, most recreationists were visiting LNP during their holidays or weekends when they were free which could be unreasonable to include time costs into their travelling costs. Such was also the case with Ward and Beal [20] who suggested that ascribing a value of zero to the opportunity cost of time makes more sense since most visitors who embark on leisure and recreation mostly do during holidays when they face no loss of income.

## **3.4 The Recreation Demand Function**

According to equation 3 under empirical framework above, total travelling cost, age, income, and education levels of individuals were regressed against average individual annual visits as a dependent variable to show their relationships. The results of linear regression analysis have been shown in Table 6.

The negative (-) value on the total travel cost coefficient was expected indicating an opposite relationship between individual visits per year and total travelling costs as reported by Hanley & Spash [16]. This simply means as the total travelling cost increases, individual visits per year decrease and the relationship is statistically significant at 1% level (.009). The results also show a direct relationship between monthly

**Table 6. Results of linear regression analysis coefficients**

Model variables	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
1 Constant ( $\alpha$ )	3.482	1.998		1.743	.086
Total_Travel_Costs	-1.234E-005	.000	-.393	-2.682	.009
Monthly_average_income	1.640E-005	.000	.516	3.146	.003
Age_of_respondent	-.007	.031	-.030	-.233	.816
Education level	-.553	.569	-.166	-.972	.335

a. Dependent variable: Visits\_per\_year

average income and individual visits per year being statistically significant at 1% level (.003). This tells that the higher the visitors earn, the more the trips they make to the park.

The results on income are opposite from what Limaie et al. [10] got but agrees with what Ortaçefime et al. [11] got. For Malawi, this is the case as most people are poor as indicated by Government of Malawi [5] therefore those with less income make less visits per year as compared to those with higher income who make more visits per year.

Although the estimated coefficients of age and educational level are negative; however, they have a small influence on individuals' visits per year to LNP as they are not statistically significant. This means these variables do not have much influence on individuals' visitation to the park. Despite the direct relationship between education level and number of visitors to the park observed in descriptive statistics, having a higher number of more educated visitors is different from having more individual visits per year and this is the case being presented here. The results on education are similar to what Winkle [14] got in Tanzania that the relationship between education and individual visitation to Arusha National Park was not significant.

#### 4. THE CONSUMER SURPLUS

The consumer surplus represents the recreation use value of the park based on the model specified in equation 4 above under empirical framework. In this study, the individual consumer surplus per visit to LNP was estimated to be MWK81, 037.28.

In getting the total consumer surplus for the park, however, education visitors were excluded as including them could overstate the consumer surplus for the park since they go there primarily to learn according to Kalima [6]. The same

applied to government officials who go there for government assignments not as recreationists. Therefore an average of 1,160 recreation visitors entered into analysis and the total annual consumer surplus for LNP was estimated to be MWK94, 003, 241.32. This reflect the recreation value of Lengwe National Park per year.

However, the recreation value of the park would be higher but the decreasing trend in number of visitors to the park is a major setback. For example, between 2005 and 2015, the number of recreationists visiting the park has decreased by 32.20% according to statistics from research and monitoring department of the park. This is very worrisome and requires an immediate action to reverse the situation. As revealed by this study, the decreasing trend in visitor numbers is reflecting to what most of the sampled visitors complained about scarcity of animals in the park. Comparing to other wildlife reserves within Chikwawa, Nyala Park have significant animal numbers while Majete game reserve is now hosting the Big Five hence competition might be high. To enable the park attract more visitors and generate more revenue, the managers, government, and other stakeholders need to take appropriate actions.

#### 5. CONCLUSION AND RECOMMENDATIONS

As the market does not provide prices for environmental goods and services, economics provide techniques and methods for valuing environmental services such as recreation. In this research, LNP was chosen and ITCM was used to estimate the recreation use value of the park. The study found a negative relationship between travel costs and visits per year while income had a direct relationship with visits per year. On the other hand, age and education were found not to be significant in influencing individuals' visitation per year. The average individual round trip travel cost was found to be



MWK92,440.56 and the individual consumer surplus (recreation value) per trip was estimated to be MWK81,037.28 while the annual recreation value for the park was estimated to be MWK94,003,241.32. However, the study had difficulties related to the calculation of the opportunity cost of travel time as there is no standard for calculating it to suit local conditions. Therefore, it did not incorporate time costs in the travel cost model. The results revealed by this study can be used by planners, investors, future researchers, and managers in managing the park or other related areas.

Following the results obtained, it was recommended that the Travel Cost Method can be used to evaluate environmental goods and services that do not command a market price such as recreation sites in Malawi.

However, a standard on the calculation of opportunity cost of travelling time for the visitors should be established if it is to be included in travel costs in future studies. We also recommend that management should re-introduce more game and protect the animals to enable the park withstand competition for visitors with other protected areas within the district such as Nyala Park and Majete wildlife reserve. On the same, access roads within the park need to be improved and potential investors can come in with new accommodation facilities for the visitors to have choice. These recommendation were reached based on the demands from the people who visited the park. Further, the study recommends that park officials must ensure that entry fees for all paying visitors should be paid depending on the number of days a visitor is to stay in the park as stipulated by government to collect full revenue that is lost from the unpaid days.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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