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The Recreational Value of Wetlands: Activities, Socio-economic Activities and Consumers' Surplus around Lake Victoria in Musoma Municipality, Tanzania

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ABSTRACT Wetlands play a big role as the important recreational destinations which contribute to the increase in tourism industry. This paper evaluates the recreational value of Lake Victoria in Musoma Municipality. Primary data were gathered by administering the questionnaire to a sample of 120 recreationists. The socio-economic data were analysed using Statistical Package for Social Sciences. Quantification of wetland benefits was done by using Microsoft Excel. The travel cost method was mainly used to determine the recreational value of the Lake Victoria. Findings show that there were a limited number of recreational activities around the Lake Victoria. Consumer's surplus was estimated to Tsh. 1,462,664,555 (US$ 1,044,760) per annum with an average value of Tsh. 9,751,113.3 (US$ 6,965) per hectare per year. Although there is a limited number of recreational activities around the Lake Victoria, policy formulation and project implementation should consider the use and non-use values of LV in order to estimate the social welfare gain or loss with respect to a proposed project or policy.

1. INTRODUCTION

Wetlands play a big role as the important recreational destinations which contribute to the increase in tourism industry (Malan 2010; Munishi and Kilungu 2004; Young 1996, 2005). They are estimated to occupy an area of 6% of earth's surface covering more than 900 million ha around the world and about 1% equivalent to an area of 250,000 km^2 of Africa (Jodi et al. 2005; Mdamo 2003). In Tanzania, the coverage of wetlands is more than 6% ranging from lake systems, river, floodplains and deltaic mangrove formations (Munishi and Kilungu 2004; Munishi et al. 2003; URT 2007). Among other benefits, wetlands play an important role in providing water, biological resources and site for recreation and in often sheer survival of people (Kirsten 2005). Sustainable management of wetlands is, therefore, critical to the long-term health, safety and welfare of many African communities. Despite their importance, wetlands are being modified or reclaimed, often driven by economic and financial motives (Munishi et al. 2003; Kirsten 2005; Kent and Mast 2005). For the past 1.5 decades, Tanzania has lost 200,000 ha of wetlands (including Lake Victoria) despite the fact that they are the natural capital upon which the country's economy depends for the production of many goods and services (URT 2007; Masiyandima et al. 2004).

Thus, if ecosystem changes result in individuals' perception that they are worse off, then it will be of interest to measure the individuals' welfare loss (Kirsten 2005; Kent and Mast 2005). Conversely, if the changes make people better off, one would want to estimate the resulting welfare gain (Heal et al. 2005; Young 1996). Hence, quantification of the benefits provided by wetlands in recreation is not an option but a necessity as much as possible if the effective choices are to be made between management and development alternatives (Young 2005; Malan 2010). This is due to the fact that decision makers, planners and politicians are very much influenced by economic issues. However, various authors advocate that tourism act as incentive to protect natural resources (including Lake Victoria) in many areas around the world (Figueroa and Pasten 2009; McNeely and Mainka 2009; De Groot et al. 2006; McCartney and van Koppen 2004). The economic valuation of wetlands is based on the

utilitarianism principles. It is mainly apprehensive with the estimation of the impact of changes in ecosystem services on the welfare of individuals. The representation of wetlands benefits in monetary units provides one of the most important mechanisms for showing that they should be formally included into wetland management (Musamba 2010; Stratos and Basil 2005).

Among other benefits, Lake Victoria (LV) provides opportunities for a wide range of recreational activities such as fishing, bird watch, Lake View site, boating and camping activities. These activities rely solely on the environmental quality of the LV (URT 2007). Despite the contribution of LV to social welfare through recreational activities, the recreational value of LV in Tanzania is not documented. Hence, the valuation of recreation value of LV is of necessity to know its contribution to local people's livelihood and to the national economy through tourism. This paper evaluates the recreational value of Lake Victoria to fill this knowledge gap.

2. METHODOLOGY

2.1 Site Description

Lake Victoria is a freshwater lake shared by three east African countries (Tanzania, Kenya and Uganda). It stretches 412 km from north to south, between latitudes $0^0$30' N and 355 km from west to east between longitudes $31^0$37' and $34^0$53' E (URT 2002). Lake Victoria is situated at an altitude of 1,134m above the sea level, and has a volume of 2,760 km^3 and an average and maximum depth of 40m and 80m respectively. Musoma Municipal is a peninsula along the Lake Victoria with a total area of 6,300 ha and the elevation ranging from 1,140m to 1,320m above the sea level[1]. Majority of the people are subsistence farmers of maize, small scale tomato growers, fishermen, livestock keepers and businessmen and few are employees. Lake Victoria is highly potential for a diversity of livelihood activities. The wetland serves as source of water for farming, livestock, and fishing and for domestic uses and provide an opportunity for recreation activities (URT 2003).

2.2 Data Collection

This paper makes use of both primary and secondary data. Primary data was collected from the field by interviewing local people and recreationists while secondary data was obtained from secondary sources. Nevertheless, primary data mainly focused on background of wetland (LV), land uses, respondents' socio-economic characteristics and recreational activities in the study area. Primary data were collected from seven wards whereby questionnaire was administered to 120 respondents involving resident and non-resident recreationists. Principally, the information collected focused mainly on number of visit, the visit seasons, expenditures, sites visited. Also people were asked to state their willingness to pay (WTP) for improved quality of Lake Victoria (LV). Information on willingness to pay for goods and services provided by wetland (LV) to the communities is a good reflector for wetland value (Turpie et al. 2003; Young 2005; Turner and Daily 2008).

2.3 Data Analysis

This paper employed both quantitative and qualitative methods for analysis of data. Quantitative analysis was performed using Statistical Package for Social Sciences. The *Kolmogorov-Smirnov test* was carried out using SPSS (version 16) to test the normality of the data which confirms that the data were normally distributed ($p>0.05$) as the condition for parametric analysis. Descriptive statistics, charts, frequencies tables and graphs were used to present the results. Ms Excel was mainly used to analyse and quantify benefits accrued from wetlands. The main approach used to capture recreational value of wetland was the Travel Cost Method.

2.3.1 Travel Cost Method (TCM)

The method was used to determine a value for Lake Victoria based on its recreational demand function. It assumed that the higher the recreational demand, the higher the value of the ecosystem. Additionally, the method was also used to assess values of a wide variety of recreational activities and services around the Lake Victoria including fishing, boating, swimming, and nature viewing. It determines the value of an ecosystem by surveying the amount of money people spent on recreational travel to Lake Victoria area. Zawacki et al. (2000), Heal et al. (2005) and Young (1996; 2005) argued that

the TCM is a useful approach to estimate use values associated with ecosystems or sites (such as forests, wildlife, parks, wetlands, and beaches) that are used for recreation to which people travel for the purpose of making pleasure by carrying out recreational activities such as hunting, fishing, hiking, or watching wildlife.

The use of this approach (TCM) was based on the assumption that the "price" of access to Lake Victoria is the function of time and travel cost expenses that people incur to visit it. Consequently, peoples' WTP to visit this site was estimated based on the number of trips that they made at different travel costs (Fig. 1). However, this is analogous to estimating peoples' WTP for a marketed good based on the quantity demanded at different prices.

Some studies suggest that this approach yields information on the value of characteristics in addition to the value of the site as a whole (Kumar et al. 2008; Kadigi 2006; Heal et al. 2005; Young 1996, 2005). Travel Cost Method was used to estimate the economic benefits or costs resulting from changes in access costs to LV, elimination of an existing recreational site, addition of a new recreational site and changes in environmental quality at a recreational site. However, the trip generating function which describes the number of visits (N_{Vij}) an individual (i) makes to site (j) was developed to estimate the value of Lake Victoria in recreation (Equation 1).

$$N_{Vij} = f\left(C_{Tij}; E_{Sij}; I_i; X_{ij}; Q_j\right) \quad [1]$$

Whereby;

= C_{Tij} the travel cost of individual to site;
= other socio-economic characteristics such as age, education;
= the income of individual;
= dummy variables (1, 0) describing various factors including whether or not the trip made by individual to site was the only purpose and
= the environmental quality at the site (LV).

The number of visit was reverted as a function of the travel costs incurred by individualto a site j (C_{Tij}) and several socio-economic characteristics of the individual including income, level of education, age, household size, sex and variables giving information on the type of the trip (Table 3). The dummy variables were representing either the single purpose trip or whether on holiday trip or on single day trip. In this paper TCM was used to estimate the demand function $f(Q)$ for the LV as the recreational site and with the help of Ms excel the demand function was generated (Equation 2). The analysis showed that, the number of trips was decreasing as the travel costs to site j (LV) increases. Figures 1 and 2 show the curvilinear shape for travel cost against number of trips made by recreationist to LV which also represented the wetland quality (plus good and services) at cost P. The curvilinear represent the following demand function:

$$f(Q) = 2491 - 100Q \quad [2]$$

Therefore the consumer surplus for individual (i) represents WTP of individual (i) for improved quality of site j. The concept of consumer surplus (CS) and producer surplus is used to measure the general satisfaction that society as a whole derives from a good or service to approximate the net willingness to pay (WTP). According to Swinton et al. (2007) and Young (2005), consumer surplus (CS) is the excess amount that consumers are willing to pay over what they actually pay for the quantity purchased. The estimates of recreation demand for Lake Victoria (LV) were based on the concept that a recreationist is subject to costs and hence, to implicit prices incurred in the consumption of the recreational experience. Thus, recreationist consumption is regulated and reflects the value of the experience to the consumer, thereby, providing a useful approach to estimate recreational demand. Using this information, the consumer surplus CS_T for 122 recreationists was estimated whereby the number of trips made by individual (i) to visit the LV was averaged to 13 trips. The consumer surplus (CS) represents the value of good in terms of net WTP and can be represented by the area under the good's demand curve bounded by price. Thus the marginal value for LV was estimated by integrating the demand function to get the area under the demand curve (Fig. 1) which is equal to consumer surplus for visiting Lake Victoria (Equation 3).

$$CS_T = \sum_{i=1}^{i=122}\left[\int_1^{13}(2491 - 100Q)\partial Q\right] \quad [3]$$

2.3.2 Scenario: Effect of Change in Wetland Quality on Consumers' Surplus

Considering Figure 2 whereby, LV_0, LV_1 and LV_2 represents three kinds of utility levels that individual obtain after visiting Lake Victoria (LV) for recreational activities. The points along each curve are representing the travel costs which

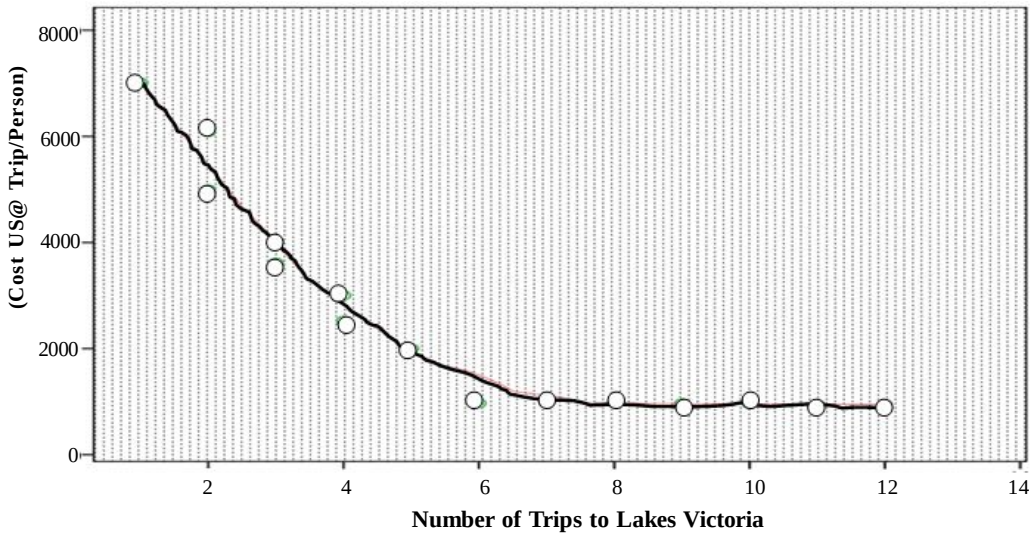

Fig. 1. Trends of number of trips made by a recreationist to Lake Victoria (2010)

corresponding to wetland quality with the same level. Suppose that point E is representing individual's initial welfare. Thus, this shows that, individual *i* can incur cost P_E for enjoying wetland quality (goods and serves) Q_E with the total utility of. LV_1 Comparing with E, W is located at the same cost level (P_E) but has better wetland quality Q_2. It looks like W is representing a higher utility level LV_2 than E.

However, Figure 2 portrays that when wetland quality changes from Q_E to, Q_2 an individual was willing to pay $P_E - P_1$ as a reasonable consumer. Currently his welfare is at V, this illustrates that he has enjoyed the wetland quality LV_0 of by spending cost P_1. Both E and V lie in the same non-difference curve, LV_1 thus they represent similar utility level LV_1. This implies that though recreationist pays $P_E - P_1$ to improve wetland quality, $Q_2 - Q_E$ his welfare level is the same. Hence, it can be established that, $P_E - P_1$ is the recreationist's WTP for consuming wetland quality, $Q_2 - Q_E$ which states the recreationist's monetary value for wetland product (goods and services) practically.

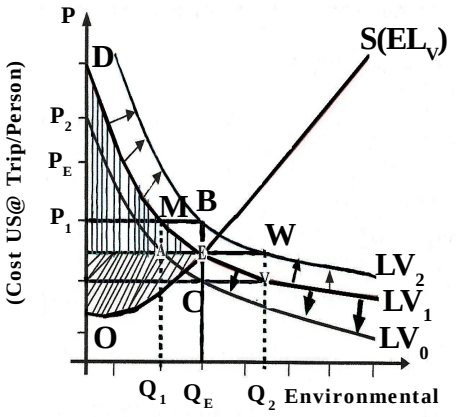

Fig. 2. Effects of change in wetland quality on consumers' surplus

Additionally, the economic measure of the benefit of such an improvement to recreationists is the maximum amount that these individuals would be willing to pay for this improvement. Paradoxically, when wetland quality degrades, the recreationist will be willing to accept $P_2 - P_E$ (Fig. 2) whereby for that moment, his welfare is at M. This indicates that, consumer has to spend higher cost for worse wetland quality than in E [supplied by $OS\,E_{IV}$] while recreationist's welfare remains unchanged. Thus, without $P_2 - P_E$ as compensation (intervention), consumer's welfare will go down from E to A, namely from to. Resulting LV_1 to LV_0 into the lowest WTA [$P_2 - P_E$] for individuals to reduce environmental cost.

3. RESULTS AND DISCUSSION

3.1 Recreation Activities around Lake Victoria

Table 1 summarizes responses on the main recreation activities which were carried out

around Lake Victoria. These results show that at least all activities involve non-consumptive utilisation of wetland. It was observed that, majority (27%) of the recreationists were visiting the area for picnics, 25% were visiting for bird watching and about 23% of recreationists wanted to access the beach. Results also show that, only few (10%; 8%; 7%) of recreationists were visiting the wetland for wildlife view, swimming and boating respectively. These results indicate that there are very limited recreational activities ($\chi^2 = 6.98$; p=0.431) in the study area (Table 1). This suggest that, there is a great potential of diversifying recreational activities around the wetland (LV) in order to attract many tourists and recreationists to visit the area.

Table 1: Responses of tourists on the main recreation activities in Musoma Municipality

Activity	*Percentage (%)*
Beach Access	23
Picnic	27
Bird watch	25
Wildlife view	10
Swimming	8
Boating	7
Total	100

($\chi^2 = 6.98$); Degree of freedom (df = 7);
Sig. (p = 0.431,α=5%)
($\chi^2 = 6.98$)

3.2 Socio-economic Characteristics of Recreationists

Results show that the average age of the respondents was observed to be 35.04 and 30.2 years old for the interviewed males and females respectively. This indicates that older people have more available time for taking more frequent trips to LV. Zawacki et al. (2000) argued that, there is a positive correlation between age and number of trips for recreation activities. Furthermore, results show that, there was a significant difference ($\chi^2 = 26.74$; p=0.031) in travel costs and expenditures between the recreationists. Since the recreationists who visited the wetland are from different areas around the world, whereby 80.3% were from outside Africa and 19.7% were from Africa then the difference in travel cost can be attributed to variations in distances from the country of origin of the recreationists which may increase the cost per unit distances (Table 2).

Table 2 shows that the mean level of education of these recreationists was 3.47 for males and 3.12 for females (obtained from assigned values of zero for no education to 4 for university level). This indicates that, most of the recreationists have attained education ranging from secondary education to university level. The mean family size was 3.9 which suggest that, *ceteris paribus* the household is a nuclear family comprises of two parents and two children. Findings show that males and females earned about US$ 1,521.57 ± 54.03 and US$ 1,358.34 ± 51.25 per month respectively. Thus the average household net income was found to be US$ 2,879.91 ± 53.9 per month (Table 2). This indicates that, males are earning higher than females. This may be attributed to the differences in net hour wage (12.4 and 10.7 hours) between the former and the latter respectively.

Table 2: Socio-economic characteristics of recreationist

Variable	*Male*		*Female*	
(1ndividual)	*Mean*	*SE*	*Mean*	*SE*
Age	35.04	0.001	30.20	0.001
Education	3.47	0.07	3.12	0.05
Paid labour hours	40.7	0.026	33.10	0.025
Net hour wage	12.4	0.024	10.7	0.024
Observations	*122*		*122*	
Variable (Household)			*Mean*	*SE*
Family size			3.9	0.006
Net household Income (US$ per month)			2 879.91	53.9
Net income male (US$ per month)			1521.57	54.03
Net income female (US$ per month)			1358.34	51.25
Non-labour income (US$ per month)			145.9	63.21
Observations			*122*	
Area of Origin			*Percentage (%)*	
From Africa			80.3	
Outside Africa			19.7	

($\chi^2 = 26.74$); Sig. (p = 0.031,α=5%);
Standard Error of income estimation (SE)

3.3 Recreation Value of the Lake Victoria

3.3.1 Effects of Travel Costs on Number of Visits to Lake Victoria

From Figure 1 we can estimate a travel cost demand curve with the travel cost as the price

and the number of trips as the quantity of wetland goods and services demanded. It can be observed that, the number of trips that an individual can make for visiting LV decrease with the increase in costs per trip. This indicates that the number of trips is a complement of wetland quality. Figures 1 and 2 represent the recreational demand for wetland goods and services prior to the development. If wetland quality is completely eliminated at this site as a consequence of any development project, then it hampers the recreation activities hence, the total consumers' surplus will be lost along with their welfare. However, the more likely consequence is that the quality of wetland for recreation activities trip will be lowered. This will cause the shifting of the demand curve (Fig. 2) hence affect the consumer's surplus. Given the increase in exerted pressure on Lake Victoria, there is a possibility of loss in wetland quality if no intervention or emphasis for the sustainable use of its resources.

Moreover, the decrease in number of trips per increase in unit cost per trip (Fig. 1) can be explained by the effect of increase in price on wetland goods and services and the law of diminishing of marginal utility. This is due to the fact that for some recreationists who do not care about the marginal increase in price of wetland goods and services, the law of diminishing of marginal utility applied to explain the case of decrease in number of trips. This implies that, the first trip of visiting wetland (unit of consumption of wetland good or service) yields more utility than the second and subsequent trips hence individual's WTP for the same site also decreases considering that there are few recreational activities (Table 1) around Lake Victoria. However, this case can also be explained by the elasticity of demand for wetland good or service as the cost per trip increase. The decrease in number of trips per marginal increase in cost (Figs. 1 and 2) is due to the fact that, with the fixed income when a cost per trip increases from to the recreationists will not be willing to pay for the visitation. In other words, the marginal increase in cost per trip will be a disincentive for recreationist to visit the wetland.

Figueroa and Pasten 2009, Heal et al. (2005) and Zawacki et al. (2000) argued that, given the rational utilitarian economic behaviour, the economic efficiency can only be achieved if the site for recreation has positive and known recreation marginal costs under the relevant range of the marshallian demand recreation curve. Figure 1 represents the demand for wetlands goods and services (Q) with a demand function $f(Q) = 2491\text{-}100Q$ which indicates that access to the Lake Victoria (wetland) for recreational activities will only be guaranteed if the income is over US$ 2,491 as an income threshold, once other needs have been satisfied. Since the average net income of the recreationist which was estimated to US$ 2,879.91 ± 53.9 per month of which is less than the income threshold (US$ 2,491), then recreationists in this case were able to make trip for the recreational activities.

3.3.2 Consumers' Surplus

Lake Victoria provides an estimated 72,036.3 hours of recreational use during the survey. Findings show that, about 122 people made 845 trips per year to Lake Victoria. The minimum trips were made by three people who spent about 30 days each with a total of 7,086 man-days in a year at the study area while the maximum trips were made by 119 people who spent about 84 days each with a total of 64,950.3 man-days in a year (Table 3). The average minimum distance travelled was less than ten kilometers (one way). However, the average distances travelled ranged between one to 7,200 kilometers. Findings show that the average expenditure during day visitation to the wetland site was Tsh. 514,946.6 ± 45,350 (US$ 367.8 ± 32.4) per person per trip whereby the average expenditure for over-night visitation to the wetland site was Tsh. 2,156,409.04 ± 82,430 (US$ 1,540.3 ± 58.9) per person per trip. The total travel cost for time was estimated to Tsh. 822,621,307.2 (US$ 587,586.6) with an average cost of US$ 23.54 per hour. The average time for travelling was 18.6 hours. The total cost in recreation was estimated to Tsh. 2,625,089,396 (US$ 1,875,063.86) per annum which was equivalent to Tsh. 17,500,595.97 (US$ 12,500.4) per hectare per year of the wetland (Table 3).

According to Swinton et al. (2007), consumer's surplus of an ecosystem is a quantitative value which measures the net benefit that a consumer derives from being able to obtain a good or service from the respective ecosystem at a given price. Young (1996) asserts that, consumer surplus is the difference between the price consumers are willing to pay and the actual price they do pay. Findings show that the marginal value in the consumer surplus declines as

Table 3: Travel cost for recreation and WTP for improved quality of Lake Victoria

	N^*	f^{**}	*Average expenditure*	*Average espending*	*Length of stay per trip*	*Man-days*	*Duration*
			(Tsh/pers/day)	*(Tsh/pers/trip)*	*(days/pers)*	*(hours)*	*(days)*
Variable							
Day visit	3	4	68659.55	514946.61	7.5	7086	30
Overnight	119	7	179700.75	2156409.04	12	64950.3	84
Total	122	-	248360.30	2671355.65	19.5	72036.3	114
Variable	N^*	f^{**}	*(US$/pers/day)*	*(US$/pers/trip)*	*(US$/pers/yr)*	*Man-days*	*(days)*
Day visit	3	4	49.04	367.82	7.5	7086	30
Overnight	119	7	128.36	1540.29	12	64950.3	84
Total	122	-	177.40	1908.11	19.5	72036.3	114
Item					*Tsh*		*US$*
Total costs for day visit per annum					6179359.2		4413.8
Total costs for overnight visit per annum					1796288730		1283063.4
Travel time cost per annum					822621307.2		587586.6
Total cost					2625089396		1875063.86

N^*=Number of visitors; f^{**}=annual trip frequency of site visitation; Average man-day spent per person (Ã) = 590.5 Total trips ©nf = 845; Day visit Error of Estimate in Expenditure (DSE)= ±Tsh.45350 (US$ 32.4); Overnight visit Error of Estimate in Expenditure (NSE)= ±Tsh.82430 (US$ 58.9); Average travel time=18.6hrs; Average cost = US$ 23.54 per hour; -do- means the same as previous

additional trips from an origin is consumed (Fig. 1). Consumer's surplus was estimated to Tsh. 1,462,664,555 (US$ 1,044,760) per annum with an average value of Tsh. 9,751,113.3 (US$ 6,965) per hectare per year. Moreover, the forgone dollar (WTP) for improved wetland quality in recreation was estimated to Tsh. 14,196 (US$ 10.14) per recreationist per trip. Based on consumers' surplus, the WTP was observed to be 0.3% of recreationists' average net income per month. This implies that, the increase of one percent in recreationists' monthly net income may result to a marginal increase of wetland value equivalent to Tsh. 393,400 (US$ 281) per hectare per annum.

4. CONCLUSION

Through evaluation of the values of wetlands in Tanzania this paper found that Lake Victoria (LV) has the great potential in supporting local people's livelihood. Its support is hinged on the benefits that are accrued by local people either directly or indirectly. Although there were a limited range of recreational activities, yet, the recreation value of LV has significantly contributes to local people's income and the nation at large. The consumers' surplus in recreation for Lake Victoria was estimated to Tsh. 1,462,664,555 (US$ 1,044,760) per annum with an average value of Tsh. 9,751,113.3 (US$ 6,965) per hectare per year.

5. RECOMMENDATIONS

Based on these findings, this paper recommends that, since there was a limited range of recreational activities it is important to expand and diversify these activities to accrue more benefits from LV. However, this calls for the need to consider use and non-use values of LV during various project implementation and policy formulation in order to know the social welfare gain or loss with respect to a proposed project. This can be achieved by integrating and emphasize multidisciplinary and inter-disciplinary approaches by creating a favourable environment (collaboration and public-private partnership) for people from different disciplines to plan and implement the sustainable way of wetland resource use. Furthermore, given the role of education on Lake Victoria management much emphasis should be put on education in line with the awareness raising campaign on role of wetland benefits on local people income. This can stimulate local people to assume their responsibilities and their involvement in managing LV resources.

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