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RESEARCH PAPER OPEN ACCESS

Factors influencing willingness to pay for wetland ecosystems conservation: a contingent valuation study of lake Victoria Ecosystem in Kenya

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Abstract – Wetland ecosystems provide us with various valuable services which are fast degrading due to the lack of effective incentive mechanisms and conservation models for stakeholders involved in managing these ecosystems. This study examines the elements affecting residents' Willingness to Pay (WTP) for the Lake Victoria biodiversity conservation initiative based on a survey of 394 households. Chi-Square test of independence was used to determine the existence of an association between various independent factors and WTP. Logistic regression was further used to determine the influence of these factors on WTP. The results showed that access to grazing land, fishing status, land ownership, business ownership, level of education, county of origin and household monthly income had a statistically significant association with WTP. From this study, it can be concluded that socio-demographic and socio-economic characteristics were constant drivers of WTP for Lake Victoria Conservation Program. This study serves as a valuable input for the identification of the market segment among the residents, which will eventually help in creating more proceeds for the preservation of biodiversity in Lake Victoria Basin. Finally, the study promotes the use of WTP in creating market-based conservation techniques in developing nations to stop the increasing loss of biodiversity and save the ecosystem.

Keywords: Economic Valuation / Willingness to Pay / Water Resources / Lake Victoria / Kenya

1 Introduction

Humans rely on wetland ecosystems to provide goods and various ecosystem services (Larsen, 2017). Ecosystem services have been defined as the benefits people obtain either directly or indirectly from ecological systems (Costanza *et al.*, 1997; de Groot *et al.*, 2002; Millennium Ecosystem Assessment, 2005). Wetlands provide habitat for both plants and animals in addition to assisting in the support of human lifestyles that depend on their different biological resources. They do this by supplying numerous goods and services and performing various functions (Brouwer *et al.*, 1999) and are regarded as a source of goods and services. Wetland ecosystems provide a variety of commodities and services on which human groups rely heavily, either directly or indirectly, for their survival (Costanza *et al.*, 1997). However, many wetlands have traditionally been deemed wastelands and have been degraded through their conversion for diverse human uses, including agricultural, industrial, and residential ones (Barbier *et al.*, 1997). Numerous scientists have investigated beneficiaries' Willingness to Pay (WTP) for environmental protection in watershed regions using the Contingent Valuation Method (CVM) (Ryan and Watson, 2009). The multiple valuable services produced by these ecosystems are fast degrading owing to a lack of effective conservation models and incentive mechanisms for stakeholders involved in maintaining such ecosystems (Costanza *et al.*, 1997; Karami *et al.*, 2020). A rising scarcity of services, along with increased strain on ecosystems, has resulted in a rise of studies focused on the Willingness to Pay concept (Wunder *et al.*, 2008). The efficient use of natural and environmental resources is dependent on their worth, which may be quantified through economic valuation. The value of water resources may be calculated based on the value of the goods or services that they contribute. Several economic valuation methodologies may now be used to estimate the economic worth of natural ecosystems and inhabitants' WTP for specific ecosystem services.

According to Martin-Lopez *et al.* (2008), the CVM is the most extensively utilized economic valuation technique to estimate the economic worth of diverse ecosystems. The CVM

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is built on the ideas of WTP, or readiness to take compensation to improve utility because of damage to a public good. In the absence of a true market, this strategy presents individuals with a hypothetical option to purchase public goods. According to Reynisdottir *et al.* (2008), both the rational choice and the utility maximization theories underpin the CVM's WTP for non-market goods. CVM is a technique that allows individuals to buy public goods in hypothetical contexts, particularly when there is no genuine market or current knowledge about a real-world issue. In CVM, surveys are used to obtain information on people's maximum WTP for biodiversity protection and conservation (Loomis and White, 1996). The maximum amount that residents or visitors agree to pay is referred to as the WTP (Kyle *et al.*, 2002). WTP is used to assess the value of non-market items, usually linked to socio-economic, institutional, or educational factors (Reynisdottir *et al.*, 2008).

The income is one of the socio-economic factors that has been popular in most CVM studies of residents' WTP. For a long time, the impact of having money on WTP has been hotly debated, but a definitive answer to the question has yet remained elusive. Several studies, however, have revealed that low-income earners are more sensitive to tax increase than high-income ones (More and Stevens, 2000). In other words, regardless of the goal, residents' WTP is mostly determined by their income level (Reynisdottir *et al.*, 2008). As a result, it is plausible to suppose that residents' income has a favorable influence on their commitment to protect their surrounding environment, including biodiversity conservation. Institutions are another important component that influence peoples' WTP. Many studies have shown that environmental views are a major predictor of WTP (Kotchen and Reiling, 2000). On the other side, attitude toward fee policy or perceived fairness has been highlighted as one of the main predictors of WTP (Rosenberger *et al.*, 2012). Before establishing or updating any fee-paying policy, it is critical to evaluate these variables. This will assist with the identification of the key market segments among people who may be able to donate more cash for biodiversity conservation.

Contingent valuation method (CVM) is a non-market valuation method that requires individuals to indicate the maximum amount they are willing to pay for the use or preservation of natural commodities, with the idea that their decisions are contingent on alternative things offered in a hypothetical market (Mamboleo, 2021). This strategy has been proved appropriate for evaluating environmental items that lack market data but have an influence on the respondents' well-being and is commonly used for cost-benefit analysis and for assessing the environmental effect of non-marketable resources (Fogarassy *et al.*, 2016). Several studies have been undertaken to estimate WTP for biodiversity conservation in wetlands and other natural attractions using CVM. WTP seems to vary according to countries and type of wetlands and is determined by the population's socioeconomic condition and ecological knowledge. This technique has been used to determine the worth of wetlands (Siew *et al.*, 2015), renewable energy sources (Botelho *et al.*, 2018), forests (Amirnejad *et al.*, 2006), and other non-market resources (Ramajo-Hernández and Saz-Salazar, 2012). CVM key benefit is that it may be used for a wide range of evaluative circumstances, as being independent of real market or observable behavior (Pearce and Moran, 1994).

Lake Victoria is the largest freshwater lake in Africa and the largest tropical lake in the world. The lake is one of the most important freshwater ecosystems in East Africa's biodiversity-rich tropical environment. Apart from providing internal maritime transit and energy, the lake also supports fishing, agriculture, nature, tourism, trade, and wildlife. The Lake Victoria Basin has suffered from ecological deprivation, which has coincided with the rapid growth of settlements surrounding the lake (Fig. 1). As a result, conservation is essential for the long-term survival of biological resources as well as the maintenance of livelihoods and wetland management that is sustainable to limit the rate of biological resources loss and deterioration.

Anthropogenic influences on fisheries, wetland buffer zones, and water quality are causing worry about the health of the Lake Victoria ecosystem. Changes in fish assemblages, deterioration of wetlands, changes in water quality, and the invasion of the water hyacinth *Eichhornia crassipes* have all placed Lake Victoria's coastline area in jeopardy (Masifwa *et al.*, 2001; Twesigye *et al.*, 2011). Despite its apparent relevance to ecology and biodiversity, substantially less is known about the value of the Lake Victoria ecosystem than just the open lake. Lack of specific understanding adds to the uncertainty generated by fast population expansion, which puts more strain on wetlands and water supplies, contributing to additional changes in Lake Victoria's environment.

Kenya is classified as a water-stressed country by the United Nations. As a result, Kenya regards its wetlands as significant resources for local people in terms of ecosystem services and habitat for coastal and aquatic animals. However, even though wetlands are essential resources for livelihoods and biodiversity conservation, little research on wetland services is being performed in Kenya. Moreover, a lack of appropriate data on publicly owned private firms typically hampers planners and government officials from implementing policies and connecting with environmental stakeholders. As a consequence, Lake Victoria's supplies are depleting. Adopting proper policies to aid in the creation and allocation of greater resources for community-based wetland conservation initiatives can assist wetland managers and policymakers. In Kenya, the lake's resources benefit local communities in Busia, Homa Bay, Kisumu, Siaya, and Migori. According to a recent study, the residents of these local communities are Willing to Pay an average of KES 500, even though many factors influence their WTP (Mamboleo and Adem, 2022). The present paper relies on these previous results to further analyse the various factors influencing fishermen, traders, and homeowners' WTP. According to previous studies, individual's WTP may depend on age, education, gender, and financial situation (Choi and Fielding, 2013; Hultman *et al.*, 2015).

2 Materials and methods

This study was conducted along the whole Kenyan Lake Victoria shoreline in East Africa. Primary data was acquired in the study region from a 2021 residents survey (Mamboleo and Adem, 2022). The questionnaire was developed to collect demographic and social information from the survey inhabitants. This research approach is appropriate since it entails delivering a questionnaire to a sample or the whole

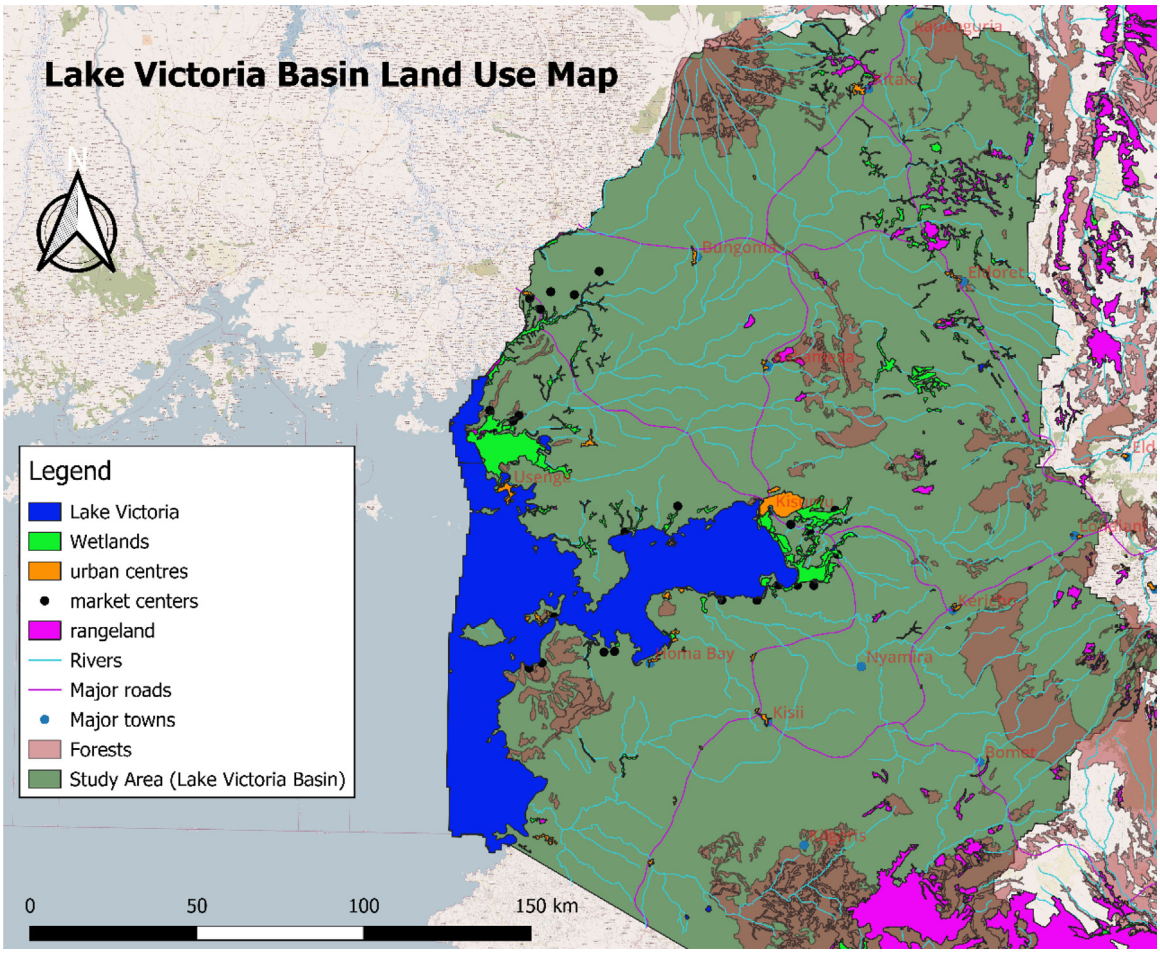

Fig. 1. Lake Victoria Basin, Kenya land use map.

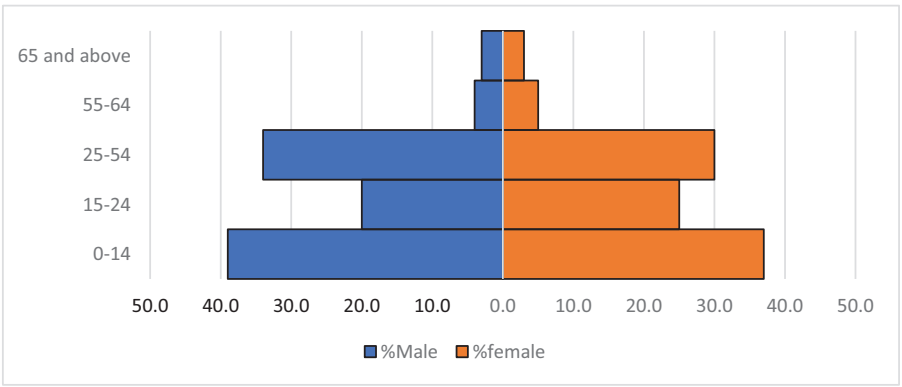

Fig. 2. Project area population pyramid. Source: Based on self-calculations adopted from (KNBS, 2019) census report.

population of people in order to characterize the attitudes, views, behaviors, or qualities of the population. The study's data was gathered using a standardized questionnaire (see Mamboleo and Adem, 2022 for further details). The first piece of the questionnaire collected respondents' demographic and socioeconomic data, while the second section solicited information on the likely components that impact the respondent's WTP for a conservation program (Mamboleo and Adem, 2022). The questionnaire was carried out in the counties of Busia, Homabay, Kisumu, Siaya, and Migori.

The Kenya 2019 Census estimated the population of residents within the Migori, Homa Bay, Busia, Kisumu and Siaya counties as 5,290,824 with an average of 4 people per household (KNBS, 2019). Figure 2 shows the population pyramid within the project area.

Equation (1) was used to get the sample size for this research.

$$n = \frac{z^2 p(1-p)}{e^2\left(1 + \frac{\left(z^2 p(1-p)\right)}{Ne^2}\right)}. \quad (1)$$

In this equation n represented the sample size, while N was the population size in the study area (5300000). Z was 1.96 for a confidence level (α) of 95%, p represented the proportion (0.6), while e was the margin of error (0.05). Therefore, the sample size was found to be (with finite population correction) 369. The binary logistic regression model, described in equation (2), identifies the parameters influencing households' WTP (Gujarati, 1999):

$$Pi = F(\delta + \beta x_i) = \frac{1}{1 + \delta^{-(\delta+\beta x_i)}}. \quad (2)$$

In this equation the index i means the ith observation, Pi is the possibility of someone making a particular choice, given that X_i (2.718), is the basis of natural logarithms, while δ and β are the model parameters. To assess how each of the explanatory factors link to a dependent variable, a chi-square analysis was employed. The in-person questionnaire was acceptable primarily because the topics at hand are somewhat professional. From a total of 1,232,558 households in the study area (KNBS, 2019), 394 households were interviewed (25 more than the number calculated in Eq. (1)). This was done to ensure that the precision of the estimate corresponded to the width of the confidence interval for the cumulative average. To guarantee that the sample gathered appropriately reflected the lake's economic activity, beaches were sampled using targeted sampling based on the area's economic activity.

3 Results and discussion

3.1 Socio-demographic factors

The socio-demographic characteristics that were captured included county of origin, Gender, Age, Marital status, educational level and household size. The samples picked per county were based on the proportionalities to the shoreline coverage by the county. Results from Table 1 show that Homa Bay County had the highest representation (43.4%) of all the respondents based on the fact that it has the longest shoreline. Busia County had the smallest number of respondents comprising only 8.4%. In terms of gender, majority were male (61.4%). 78% of household heads were over the age of forty. 82.5% of the respondents were married while only 17.5% of the household heads were either single or widowed.

From this study it was clear that the majority of household heads (43.9%) beneficiated from a secondary education level. Other levels of education were Primary school (35.5%), Diploma (13.5%) and others (3%). Less than four-person households (61.42%) outnumbered those with more than four people. This was a clear indication that family planning was making significant progress in the region. These respondents were engaged in the following economic activities: fishing, farming, trade, livestock keeping, sand harvesting and formal employment (Tab. 2).

Table 1. Demographic characteristics of the study area.

Groupings		Frequency	%
County	Busia	33	8.4
	Homa Bay	171	43.4
	Kisumu	60	15.2
	Migori	49	12.4
	Siaya	81	20.6
Gender	Female	152	38.6
	Male	242	61.4
Age	Above 40	179	54.6
	Below 40	215	1,000
Marital status	Married	325	82.5
	Single	69	17.5
Education level	Primary	140	35.5
	Secondary	173	43.9
	Diploma	53	13.5
	Degree	16	4.1
	Others	12	3
Household size	Above 4	242	61.4
	Below or equal to 4	152	38.6

Table 2. Economic activities.

Economic activities	Yes (%)	No (%)
Fisherman	177 (44.9)	217 (55.1)
Farming	101 (25.6)	293 (74.4)
Merchants	55 (14)	339 (86)
Livestock husbandry	37 (9.4)	357 (90.6)
Sand harvesting	35 (8.9)	359 (91.1)
Government employee	17 (4.3)	377 (95.7)
Unemployed	15 (3.8)	379 (96.2)

Results from Table 2 show that 44.9% of the respondents were involved in fishing, 25.6% were doing small scale farming along the lake, 14% were engaged in small scale trade and 9.4% were involved in livestock keeping. The respondents were further asked to give their perceptions on the current problems they face and faced by the lake' ecological system. The greatest concerns of the respondents were the decline in income as reported by 64.2%, the decrease in fish catches (44.9%), water degradation (42.4%), siltation (33.9%) and the decline in biodiversity (25.1%). These results are presented in Figure 3.

Finally, the respondents gave their opinion on the level of importance attached to ecological conservation with 90.1% reporting that it is either very or quite important to conserve the environment, as shown in Table 3.

The socio-demographic aspects influencing WTP included county of origin, gender, age, marital status, level of education and household size. The Chi square association test was performed to test the hypothesis that "there was no significant relationship between WTP and socio-demographic characteristics". A confidence level of 95% was used in this study. A chi square test p-value of less than 0.05 leads to rejecting the null hypothesis. The results obtained are presented in Table 4.

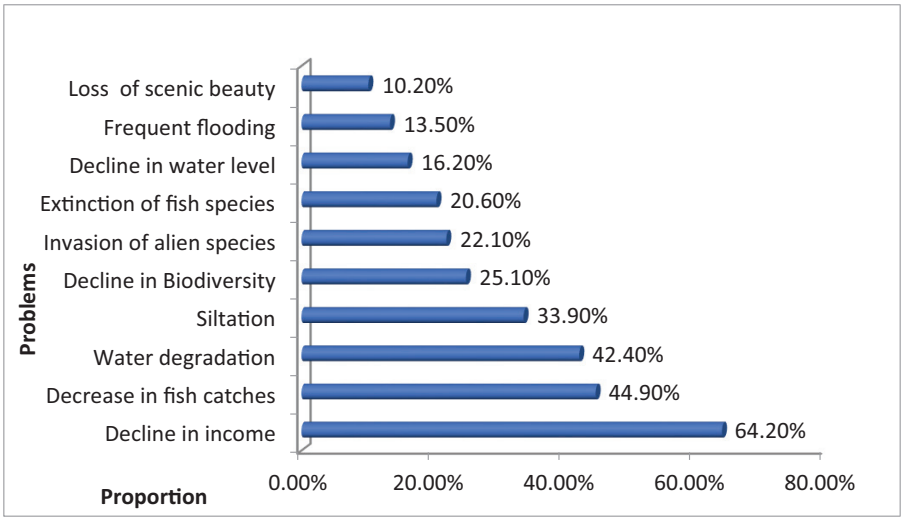

Fig. 3. Most serious problems along Lake Victoria.

Table 3. Level of importance attached to ecological conservation.

Level of importance	Respondents (%)
Not at all important	1 (6.1)
Not very important	28 (9.6)
Quite important	70 (23.9)
Very important	194 (66.2)

The socio-demographic parameters impacting significantly WTP were identified using multilevel logistic regression (Tab. 5). According to the model socio-demographic factors accounted for 26.3% of the total variation in the WTP, with respondents' county, age, and educational level significantly influencing WTP (Tab. 5).

Keeping all other factors constant, the proportion of Siaya residents who were willing to pay for a Lake Victoria ecosystem conservation program was higher compared to the other counties. Furthermore, a resident over the age of 40 was 1.829 times more likely to pay than a resident under the age of 40. A previous study conducted by (Acquah and Abunyuwah, 2011) in Ghana, also obtained a similar finding. Finally, when all other characteristics were held constant, the results revealed that a resident with a diploma was the most likely to pay (5.089) compared to others.

The results showed that the participation of older respondents in the water conservation program of Lake Victoria was higher than that of young respondents. A possible reason may be that most elders may be interested in conserving the water resources of the Lake Victoria ecosystem because they wanted this resource to be available for their descendants. The study also noted that older people were probably more closely associated with their villages and traditions, making them willing to pay more than younger ones. Another likely cause may be that fishing activities that bring most of the economic benefits from the waters of Lake Victoria are carried out by older people. The dependent variable and literacy rate were shown to have a positive association. Those residents with a diploma had the highest regression coefficient of 1.627 and a Wald coefficient of 18.331. Many studies have found that education is an important factor of WTP (Baral *et al.*, 2008). WTP has been demonstrated to be positively connected to a greater degree of education. This is due to the fact that educated individuals are more aware of environmental concerns and thus more inclined to participate in conservation actions (Brennan *et al.*, 2007).

3.2 Socio-economic factors

Several elements were evaluated to identify the socio-economic aspects impacting WTP. These included fishing, lakefront property ownership, lakefront farming, access to grazing area, sand harvesting, small trading around the lake, business ownership, and average monthly income. The Chi square test of independence was employed to see if there was a link between socio-economic characteristics and WTP. The null hypothesis was that socio-economic conditions and desire to pay are independent. Table 6 shows that fishing status, land ownership, access to grazing land, business ownership, and household monthly income have a statistically significant connection with WTP.

Table 6 reveals that people who fish along the lake, own land next to the lake, have access to grazing area next to the lake, own enterprises close to the lake, and have an average income of more than KES10,000 are more likely to pay for the program than their counterparts. This means that people who profit directly or indirectly from the lake are prepared to pay for the program, as opposed to those who do not have access to any form of service or commodity from the lake. To determine the socio-economic factors significantly influencing residents' WTP, a logistic regression model was fitted to the data. Table 7 shows that socio-economic factors accounted for 28.2% of all the variations in the WTP. The results show that involvement in fishing, involvement in farming next to the lake, access to grazing land, monthly income and business ownership have statistically significant influence on the WTP.

Table 4. Socio-demographic factors influencing residents' WTP.

Socio-demographic factors		Willingness to pay		X^2 value (exact)	*df*	*p* value
		No (%)	Yes (%)			
County	Busia	75.8	24.2	47.522	4	0.0000
	Homa Bay	63.7	36.3			
	Kisumu	76.7	23.3			
	Migori	63.3	36.7			
	Siaya	27.3	72.8			
Gender	Male	58.7	41.3	0.055	1	0.815
	Female	59.9	40.1			
Age	Below 40	60.9	39.1	0.63	1	0.427
	Above 40	57	43			
Marital status	Single	52.2	47.8	1.678	1	0.195
	Married	60.6	39.4			
Level of education	Primary	68.6	31.4	34.664	4	0.000
	Secondary	64.7	35.3			
	Diploma	28.3	71.7			
	Degree	37.5	62.5			
	Other	33.3	66.7			
Household size	Above 4	53.9	46.1	2.758	1	0.097
	Below 4	62.4	37.6			

Table 5. Logistic Regression of Socio-demographic Factors. Concerning counties, Busia was coded as 1, Homabay was coded as 2, Kisumu was coded as 3, Migori was coded as 4 and Siaya as 5. For level of education degree was coded as 1, diploma as 2, other levels as 3, primary as 4 and secondary as 5. Female was coded as 1 and male as 2. Household size above 4 was coded as 1 while below 4 was coded as 0. For the marital status, married was coded as 1 while single as 0. Finally, those aged above 40 were recorded as 1 and below 40 as 0. The response variable WTP was coded as 0 for No and 1 for yes.

Step	–2 Log likelihood	Cox & Snell R square		Nagelkerke R Square		
1	447.642[a]	0.195		0.263		
Socio-demographic Factors	B	S.E.	Wald	df	Sig.	Odds Ratio
Siaya County			38.971	4	0.000	
Busia County	–1.721	0.504	11.647	1	0.001	0.179
Homa Bay County	–1.701	0.323	27.753	1	0.000	0.182
Kisumu County	–2.328	0.448	27.018	1	0.000	0.097
Migori County	–1.982	0.435	20.727	1	0.000	0.138
Sex (Female with ref. Male)	0.091	0.244	0.140	1	0.708	1.096
Age of respondent (above 40)	0.604	0.265	5.202	1	0.023	1.829
Marital Status (married)	–0.126	0.342	0.135	1	0.713	0.882
Secondary Education			30.855	4	0.000	
Degree Education	0.994	0.598	2.759	1	0.097	2.702
Diploma Education	1.627	0.380	18.331	1	0.000	5.089
Other levels of education	1.261	0.674	3.503	1	0.061	3.530
Primary Education	–0.505	0.287	3.105	1	0.078	0.603
Household size (above 4)	0.209	0.287	0.530	1	0.466	1.232
Constant	0.628	0.403	2.429	1	0.119	1.874

Those who are not involved in fishing, not involved in farming, don't have access to grazing land and those who don't own businesses are respectively 0.308, 0.388, 0.335 and 0.318 times less likely to pay as compared to their counterparts. On the other hand, those who earn more than 10,000 are 3.165 times likely to pay compared to those earning less than 10,000.

The findings show that households that fished, owned land on Lake Victoria's periphery, owned grazing land, had a business near the lake's periphery, and had a high average income were more willing to pay than their counterparts because they were expected to be more involved in activities that directly used Lake Victoria water than their counterparts. A similar tendency was noticed by (Johnson *et al.*, 2008), who stated that water resource management decisions might be dependent on the location of agricultural land or settlements. Households that rely on Lake Victoria's water as their primary

Table 6. Association between Socio-economic factors and WTP (1USD was equivalent to 112KES, December 2021).

Socio-economic factors		Willingness to pay		X^2 value (exact)	df	*P* value
		No (%)	Yes (%)			
Fishing	No	66.7	33.3	10.432	1	0.000
	Yes	47.3	52.7			
Land ownership near the lake	No	70.8	29.2	22.791	1	0.000
	Yes	47.1	52.9			
Farming near the lake	No	46.5	53.5	0.036	1	0.850
	Yes	47.9	52.1			
Grazing land	No	71.9	28.1	36.649	1	0.000
	Yes	41.6	58.4			
Sand harvesting	No	68	32	0.012	1	0.913
	Yes	66.7	33.3			
Petty trading	No	65.8	34.2	0.614	1	0.433
	Yes	75	25			
Owning business around the lake	No	63.4	36.6	4.094	1	0.043
	Yes	53.3	46.7			
Monthly household total income	>KES.10,000	50.8	49.2	21.3	1	0.000
	<KES.10,000	75.2	24.8			

Table 7. Logistic Regression of Socio-economic Factors. WTP (coded as 1 for willing to pay and 0 for not willing to pay) was the response variable. The explanatory variables were involvement in fishing (coded as 1 for no 0 for yes), involvement in sand harvesting (coded as 1 for no 0 for yes), farming next to the lake (coded as 1 for no 0 for yes), monthly income (coded as 1 for > KES10,000 and 0 for < KES10,000) access to grazing land near the lake (coded as 1 for no 0 for yes) carrying out petty trade along the lake (coded as 1 for no 0 for yes) and owning business next to the lake (coded as 1 for no 0 for yes).

–2 Log likelihood		Cox & Snell R Square			Nagelkerke R Square	
440.427[a]		0.209			0.282	
Socio-economic Factors	B	S.E.	Wald	df	Sig.	Odds Ratio
Involved in fishing (1)	–1.179	0.326	13.076	1	0.000	0.308
Farm on land near Lake Victoria (1)	–0.946	0.315	8.994	1	0.003	0.388
Access to grazing land near Lake Victoria (1)	–1.093	0.257	18.026	1	0.000	0.335
Petty trading (1)	0.630	0.659	0.915	1	0.339	1.877
Any business around Lake Victoria (1)	–1.145	0.279	16.794	1	0.000	0.318
Sand harvesting (1)	0.301	0.610	0.244	1	0.621	1.351
Monthly income (1)	1.152	0.264	19.059	1	0.000	3.165
Constant	0.271	0.722	0.141	1	0.708	1.311

supply of water for fishing and other economic activities (in our case grazing) were more ready to pay than those who were not active in agriculture. In a study evaluating Norfolk Broads (Bateman *et al.*, 2000) observed that respondents' socio-economic conditions and distance to the site provide consistent response in terms of respondents to the survey questionnaire, response to the willing to pay principal question, and in determining the amount of WTP. Theoretically, it is expected that families involved in agricultural operations near the Lake Victoria shoreline derive the greatest economic advantage from the utilization of water resources, and hence their chance of payment will be greater than that of their counterparts. The findings are congruent with a conceptual model developed by Leeworthy and Bowker (1997), that describes the relationships between economy and the environment. The model argues that real circumstances on wetlands in terms of the quality and quantity of water resources are crucial elements in affecting human perception of conservation. This explains why the amount of demand for the economic worth of water resources from the standpoint of agriculture has a considerable impact on a person's impression of the lake's value.

4 Conclusion

This research sheds light on the impact of socio-demographic and socio-economic factors on WTP and the use of WTP in sustainable funding to create market-based conservation techniques in under-developed nations to reduce ongoing biodiversity losses. The study used a Logit regression model to examine the impact of socio-economic characteristics on citizens' WTP for a Lake Victoria conservation initiative.

The study found that socio-demographic factors accounted for 26.3% of all the variations in the WTP while socio-economic factors accounted for 28.2% of all the variations in the WTP. The study shows that residents' WTP was influenced by their ability to fish along the lake, own land close to the lake, access grazing area adjacent to the lake, own enterprises near to the lake, and their income. County of Origin, gender, age, marital status, level of education, and household size also greatly influenced a resident's WTP for ecosystem conservation program. This paper adds to the current non-market valuation literature by assessing factors influencing the residents' WTP to promote the development of conservation programs, especially where money for conservation is scarce. This study work might serve as a useful reference for future valuation studies in wetland ecosystems in Kenya and other developing countries. Furthermore, education has been demonstrated to be positively related to WTP for conservation efforts. As a result, media-based public education, and the inclusion of environmental management courses in school curriculum can be adopted. This will aid in adequately informing residents about the importance of caring for their environment and using the benefits of water ecosystems. The study further recommends that before giving any policy recommendation aimed at making water resources sustainable for the lake or any water bodies in Kenya, the effects of income distribution among the households on WTP need to be critically studied.

References

Acquah H, Abunyuwah I. 2011. Logit analysis of socio-economic factors influencing people to become fishermen in the Central Region of Ghana. *J Agric Sci* 56: 55–64.

Amirnejad H, Khalilian S, Assareh MH, Ahmadian M. 2006. Estimating the existence value of north forests of Iran by using a contingent valuation method. *Ecol Econ* 58: 665–675.

Baral N, Stern MJ, Bhattarai R. 2008. Contingent valuation of ecotourism in Annapurna conservation area, Nepal: Implications for sustainable park finance and local development. *Ecol Econ* 66: 218–227.

Barbier EB, Acreman M, Knowler D. 1997. Economic valuation of wetlands: A guide for policy makers and planners. Ramsar Convention Bureau, Gland, Switzerland. 116 p.

Bateman I, Langford IH, Nishikawa N, Lake I. 2000. The axford debate revisited: a case study illustrating different approaches to the aggregation of benefit data. *J Environ Plan Manag* 43: 291–302.

Botelho A, Lourenço-Gomes L, Pinto LM, Sousa S, Valente M. 2018. Discrete-choice experiments valuing local environmental impacts of renewables: Two approaches to a case study in Portugal. *Environ Dev Sustain* 20: 145–162.

Brennan D, Tapsuwan S, Ingram G. 2007. The welfare costs of urban outdoor water restrictions. *Aust J Agric Resource Econ* 51: 243–261.

Brouwer R, Langford IH, Bateman IJ, Turner RK. 1999. A meta-analysis of wetland contingent valuation studies. *Regl Environ Change* 1: 47–57.

Choi AS, Fielding KS. 2013. Environmental attitudes as WTP predictors: A case study involving endangered species. *Ecol Econ* 89: 24–32.

Costanza R, d'Arge R, De Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neill RV, Paruelo J, Raskin RG, Sutton P, Van Den Belt M. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387: 253–260.

De Groot RS, Wilson MA, Boumans RM. 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecol Econ* 41: 393–408.

Fogarassy C, Kerpely K, Horváth B, Bakosné Böröcz M. 2016. Analysing the attributes of ecological evaluation on local and regional levels via willingness to pay (WTP). *Appl Ecol Environ Res* 3: 129–145.

Gujarati D. 1999. Essentials of econometrics. Boston, USA: Irwin/McGraw-Hill, 534p.

Hultman M, Kazeminia A, Ghasemi V. 2015. Intention to visit and willingness to pay premium for ecotourism: The impact of attitude, materialism, and motivation. *J Bus Res* 68: 1854–1861.

Johnson E, Moran D, Vinten AJA. 2008. A framework for valuing the health benefits of improved bathing water quality in the River Irvine catchment. *J Environ Manag* 87: 633–638.

Karami O, Yazdani S, Saleh I, Rafiee H, Riahi A. 2020. A comparison of Zayandehrood River water values for agriculture and the environment. *River Res Appl* 36: 1279–1285.

KNBS. 2019. Kenya Population and Housing Census Volume I: Population by county and sub-county. Kenya National Bureau of Statistics. Nairobi, Kenya. Available at https://www.knbs.or.ke/download/2019-kenya-population-and-housing-census-volume-i-population-by-county-and-sub-county/

Kotchen MJ, Reiling SD. 2000. Environmental attitudes, motivations, and contingent valuation of nonuse values: a case study involving endangered species. *Ecol Econ* 32: 93–107.

Kyle GT, Graefe AR, Absher JD. 2002. Determining appropriate prices for recreation on public lands. *J Park Recreat Administr* 20: 69–89.

Larsen MC. 2017. Contemporary human uses of tropical forested watersheds and riparian corridors: Ecosystem services and hazard mitigation, with examples from Panama, Puerto Rico, and Venezuela. *Quat Int* 448: 190–200.

Leeworthy V, Bowker J. 1997. Non-market economic user values of the Florida. Key West, Florida, 41p.

Loomis JB, White DS. 1996. Economic benefits of rare and endangered species: summary and meta-analysis. *Ecol Econ* 18: 197–206.

Masifwa WF, Twongo, T, Denny P. 2001. The impact of water hyacinth, *Eichhornia crassipes* (Mart) Solms on the abundance and diversity of aquatic macroinvertebrates along the shores of northern Lake Victoria, Uganda. *Hydrobiologia* 452: 79–88.

Mamboleo M, Adem A. 2022. Estimating willingness to pay for the conservation of wetland ecosystems, Lake Victoria as a case study. *Knowl Manag Aquat Ecosyst* 423: 22.

Mamboleo M. 2021. Evaluation and use of existing economic valuation methodologies in the management of Lake Victoria's water resources. *RUDN J Ecol Life Saf* 29: 341–354.

Martin-Lopez BE, Montes C, Benayas J. 2008. Economic valuation of biodiversity conservation: the meaning of numbers. *Conserv Biol* 22: 624–635.

Millennium Ecosystem Assessment, 2005. Ecosystems And Human Well-Being: Wetlands and Water. World Resources Institute, Washington, DC.

More T, Stevens T. 2000. Do user fees exclude low-income people from resource-based recreation? *J Leisure Res* 32: 341–357.

Pearce D, Moran D. 1994. The economic value of biodiversity. London, UK: Routledge. 172p.

Ramajo-Hernández J, del Saz-Salazar S. 2012. Estimating the non-market benefits of water quality improvement for a case study in Spain: A contingent valuation approach. *Environ Sci Policy* 22: 47–59.

Reynisdottir M, Song H, Agrusa J. 2008. Willingness to pay entrance fees to natural attractions: An Icelandic case study. *Tourism Manag* 29: 1076–1083.

Rosenberger RS, Needham MD, Morzillo AT, Moehrke C. 2012. Attitudes, willingness to pay, and stated values for recreation use fees at an urban proximate forest. *J For Econ* 18: 271–281.

Ryan M, Watson V. 2009. Comparing welfare estimates from payment card contingent valuation and discrete choice experiments. *Health Econ* 18: 389–401.

Siew MK, Yacob MR, Radam A, Adamu A, Alias EF. 2015. Estimating willingness to pay for wetland conservation: a contingent valuation study of Paya Indah Wetland, Selangor Malaysia. *Procedia Environ Sci* 30: 268–272.

Twesigye CK, Onywere SM, Getenga ZM, Mwakalila SS, Nakiranda JK. 2011. The impact of land use activities on vegetation cover and water quality in the Lake Victoria watershed. *Open Environ Eng J* 4: 66–77.

Wunder S, Engel S, Pagiola S. 2008. Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecol Econ* 65: 834–852.

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