

**RESEARCH ARTICLE**

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**Total Economic Value of Kingwal Wetland to the Surrounding Community,  
Nandi County, Kenya**

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**Abstract**

*This study was undertaken in Kingwal wetland. The objective of the study was to evaluate the estimated economic value of Kingwal wetland. This was meant to help policy makers and conservationists develop effective measures to conserve the wetland especially in preservation of the rare Sitatunga antelopes whose numbers are reported to be decreasing due to the increasing human activities within the wetland. Data was collected in the months of January and February, 2018 from two hundred and forty respondents extracted from people living not more than 3km away from Kingwal wetland through systematic random sampling. Questionnaires, interviews and focused group discussions were used in data collection. The data collected were analyzed using descriptive statistic test. Results showed that the mean household willingness-to-pay per annum for Kingwal wetland was Ksh. 549,442 (US \$5494.42). From the results, direct benefits contribute the highest monetary value (Ksh. 292,010) as compared to indirect (Ksh.112,561), option (Ksh. 62,649), bequest (Ksh. 26,125) and existence values (Ksh. 56,097). The study concluded that Kingwal wetland has an economic value of Ksh. 549,442 (US \$5494.42) and that direct benefits (Ksh. 292,010) contribute the highest monetary value. The study recommended that there is a need to raise awareness regarding the economic worth of the benefits of wetlands to the people.*

**Keywords:** Benefits, Contingent Valuation (CV); Willingness-To-Pay (WTP); Economic Valuation

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**INTRODUCTION**

Wetlands are very important natural resources to people (Baral *et al.*, 2016) as they provide food (fish, traditional vegetable), water, herbal medicine and building materials (MEMR, 2012; Mulei *et al.*, 2014). Despite of their importance, they are facing a lot of threats from the people due to their undervaluation (Ambastha *et al.*, 2007 cited by Khan & Abbasi, 2015) and disapproval of the services wetlands provide to them (De Groot *et al.*, 2006) among other reasons. If degradation and destruction of wetlands continues due to pressure from human activities as a result of undervaluation which has led to their

clearance for other use and disapproval, it will result in the loss of the valuable benefits/services wetlands provide to people (Alexander *et al.*, 2012). To avert this, economic valuation of wetland values is necessary to ensure that sound decisions are made to promote effective conservation rather than degradation and diversion for other purposes. This is because wetland monetary valuation is among the numerous varieties of wetland assessment used in making intelligent conclusions about sound-use and sustainable management of wetland ecosystems (De Groot *et al.*, 2006).

In the past, there was little and/or no knowledge on the economic valuation of

natural resources including wetlands because it was difficult to put a monetary value to them due to lack of natural resource valuation methods and the fact that nearly all natural resources are not sold in the market and therefore most of them do not have a market price (Salem *et al.*, 2012). However, it has been easier to define monetary value for almost all manmade products because majority of them are sold in the market hence apply the use of market price. However recently, natural resource conservationists (Ramsar Convention, Convention of Biological Diversity, Worldwide Fund, the World Conservation Union and other natural resource-based organizations) have come up with ways of economically valuing natural resource benefits and costs (De Groot *et al.*, 2006). As a result, numerous studies have been done on wetland valuation in the world (Brander *et al.*, 2006) most of which revealed that wetlands have an economic value. From the studies, it has been shown that there are different monetary methods used for valuing wetland services and they are subdivided into three; direct market, indirect market and survey-based valuation.

Manmade and some natural resources employ direct market valuation method whereby the market price of the service/benefit/cost is applied (for instance in fish, beef meat which can be sold) while many other natural resources make use of indirect market valuation (revealed preference) methods entailing the use of damage/avoided cost, replacement, substitution, restoration and travel costs and hedonic pricing which measure only the use value. Nearly all natural goods and services utilize survey-based valuation whereby Contingent valuation (CV) and group valuation are used (De Groot *et al.*, 2006).

Contingent Valuation method is a method whereby people are asked to give their Willingness To Pay (WTP) for a given ecosystem service and/or their Willingness To Accept (WTA) as compensation in case of loss of a given ecosystem service

(benefit, cost or loss of the benefit) or WTA as compensation in case of losses incurred due to the presence of an ecosystem service. CV questions can be open-ended or closed ended (Zenh *et al.*, 2011 cited by Sumukwo *et al.*, 2012).

The Contingent Valuation method has been used widely both in developed and developing countries for instance by Carson and Hanemann, (2005), De Groot *et al.*, (2006), Wasike (1996) and Akala (2001) among others with success.

Being a valuation method, which has been used with effectiveness, CV was applied in this study. It is because of its flexibility (Carson & Hanemann, 2005) and efficiency in measuring the Total Economic Value (TEV) of both use and non-use values of any given natural ecosystem goods and services (Stevens, Belkner, Kittredge & Willis, 1999) that made CV method the best alternative for this study unlike revealed preference methods which give the actual preference economically estimating only the use value but not the non-use value. Likewise, since numerous observational data faces a lot of monetary difficulties that can be evaded by using CV (Carson & Hanemann, 2005).

Kingwal, one of the important wetlands in Kenya provides many benefits to the local people including wild fruits and vegetables (nutritional benefits), herbal medicine (medicinal benefits), grass for house thatching and livestock grazing (commercial benefits) among others. It also has the highest number of Sitatunga antelopes in Kenya (Magut, 2014) which are rare animals and are currently threatened and almost driven to extinction due to human activities which has led to habitat degradation and direct attack from farmers whose crops have been destroyed by the animals (Matoke, 2017). This study was therefore necessary to determine the economic value of Kingwal wetland by determining the monetary value of the benefits that accrue to the local people so as to help in developing effective measures to

promote sustainable management of the swamp and the Sitatunga antelopes. Besides this, wetland benefits for most wetlands in Kenya including Kingwal wetland have not been determined in monetary value yet this is very important for both conservationists and the local people. Findings of this study will inform conservationists on the importance of wetlands and valuation of other natural resources with a view of garnering local support for wetlands and other protected areas. This will in turn promote sustainability of the wetlands for the survival of the Sitatunga and other wildlife found therein.

In addition, few researches have been done to document and analyze the economic value of Kingwal wetland's benefits to the local people. This study was therefore necessary in order to enable conservationists and the local people come up with effective measures to successfully manage and conserve it so as to increase its benefits and reduce its costs to the local people. The objective of this study was to evaluate the estimated total economic value of Kingwal wetland.

## **MATERIALS AND METHODS**

### **Study Area**

Kingwal wetland found in Nandi County, Kenya was selected for the study because it has the highest number of Sitatunga antelopes in Kenya (Magut, 2014) which are rare animals at the same time are currently threatened and are almost driven to extinction. It is situated 400km from Nairobi city and about 25 kilometers from Eldoret town and its area is 2.73 km<sup>2</sup> (Nandi District Development Plan 2002-2008 cited by Sitienei *et al.*, 2012; Lesiyampe *et al.*, 2018). It is a protected area guarded by the Kenya Wildlife Service (KWS) because of wild animals in it but has not been gazetted as a protected area because it is not clear who owns the land that the wetland pass through according to KWS official interviewed by the researcher in May, 2018. Local people living around Kingwal wetland practiced economic activities

including crop farming, bricks making, livestock keeping, agro forestry among others. Most of these economic activities are supported by the wetland (Ambasa, 2005). Kingwal wetland is therefore a very significant resource to the local people living around it.

### **Methods**

The study targeted household heads of people living around Kingwal wetland and community and administration leaders. 240 households were selected from 2404 households living close to the wetland (KNBS, 2009) and household heads were selected to fill questionnaires. This was 10% of the total population and was adopted from Mugenda and Mugenda (2013) who suggested that a sample size can range between 10% to 30% for a population below 10,000. To obtain 240 respondents, the study area was subdivided into three parts, upper, middle and lower Kingwal based on the terrain. From the upper Kingwal, 60 (25%) respondents were given questionnaires, 84 (35%) from the lower Kingwal and 96 (40%) from the middle Kingwal based on their population density.

Six groups were organized for focused group discussions and community-based conservation leader, Kenya Forest Service, Kenya Wildlife Service and National Environmental Management Authority representatives were interviewed.

Systematic random sampling (Kothari, 2004) was applied in selecting respondents from the 240 respondents whereby every fifth household was selected. Purposive sampling was employed in selecting key informants for interviews which included interview with area chiefs/assistant chiefs, village elders, and county minister for environmental and natural resources, KFS, KWS and NEMA representatives.

### **Data Collection Methods**

Structured questionnaires, personal interviews and focused group discussions were the primary data collection methods chosen for the study. Questionnaires were

administered to 240 respondents. Area chiefs, village elders, county officials, NEMA, KWS and nature Kenya representatives were interviewed to verify facts given by the local people in the questionnaires and to obtain more detailed information.

Contingent Valuation Method was used in the preparation of questions. This was applied in that respondents were asked how much they were willing to pay (WTP) for the benefits they were obtaining from the wetland (direct and indirect value) and how much they were WTP to preserve services and goods they obtain for future own use (Option value). They were also asked the amount they were WTP in order to ensure that the future generation (bequest value) obtain the benefits from the wetland and their WTP to preserve its nature (existence value).

#### Data Analysis

Monetary values were based on contingent valuation method (CVM), a method which involved asking people how much they are willing to pay (WTP) for the benefits they obtain from the wetland. The collected data were analyzed using descriptive statistics to obtain the range, mean, standard error and sum. The Total Economic Value of Kingwal wetland was then evaluated by calculating the sum of the mean of each specific value (direct, indirect, option, existence and bequest values).

## RESULTS AND DISCUSSION

### Socio-Economic Characteristics of the Respondents

To come up with 240 respondents in order to administer questionnaires to, the researcher

took 40% (96) of 240 respondents from the middle Kingwal, 35% (84) from lower Kingwal and 25% (60) from the upper Kingwal based on population density of the three parts. A high percentage of males (69%) were interviewed as opposed to females (31%) and the highest number of respondents aged between 45-59 years (41%), followed by those with 30-44 years (31%), then those with 60 and above years (16%) and the least interviewed were those with 15-29 years (12%). It was shown that a higher number of respondents interviewed had no education (29.6%), followed by those with primary education (27.5%), then those with tertiary education (23.3%) and the least had secondary education (19.6%). Most of the respondents lived between 1.01-1.5 km away from Kingwal wetland (20.4%), followed by those living between 0.51-1 km (20%) and 1.51-2 km (20%), very few of them lived between 0-0.5km away from the wetland.

Based on economic activities done by the local community for a living, results showed that most of the respondents interviewed were crop farmers (16.67%), a number of them combine crop farming with other economic activities to support their daily lives for instance 14.83% are livestock keepers and crop farmers, 8.75% are crop farmers and bricks manufacturers, 6.25% are crop farmers, livestock keepers and teachers at the same time teachers among others.

Table 1: Level of Income of the Respondents

	Frequency	Percentage	Chi-square goodness of fit test
Less than 20,000 Ksh	10	6.2	$\chi^2=42.33$
20,001-40,000 Ksh	13	6.7	df=10
40,001-60,000 Ksh	33	13.7	p=0.00
60,001-80,000 Ksh	27	11.3	
80,001-100,000 Ksh	37	15.4	
100,001-120,000 Ksh	23	13.7	
120,001-140,000 Ksh	22	9.6	
140,001-160,000 Ksh	33	9.2	
160,001-180,000 Ksh	11	5.4	
180,001-200,000 Ksh	15	4.6	
Over 200,000 Ksh	16	4.2	

From the table above, a higher number of respondents earn income of between 80,000-100,000 Kenya shillings per month

(15.4%) followed by those earning 100,001-120,000 Ksh and 40,001-60,000 Ksh

(13.7%). Very few earn over 200,000 Ksh (4.2%).

The average size of the respondent's household was five members with most of them having a family size of four members (25.8%) and a few having over ten members (0.83%). A higher number of respondents had a family size of 4 members (25.3%), followed by those with 5 members (18.33%), then those with 6 members (17.5%), followed by those with 3 members and the rest few had a family size of between seven to ten members.

The benefits extracted by the local people from Kingwal wetland are economic, water,

recreational and tourism, nutritional, socio-cultural, medicinal, educational and research, flood control and nutrient retention benefits (Chepkwony *et al.*, 2018).

Respondents' opinions on their WTP for the benefits they derived from Kingwal wetland and WTP for the wetland's preservation for future use were identified and grouped into direct, indirect and option values (use values) and existence and bequest value (non-use values) based on the guide for policy makers and planners' total economic valuation approach developed by Barbier *et al.*, (1997). Results are shown in the table below.

Table 2: Summary of Descriptive Statistics on Household WTP per Year

Benefits Derived from Kingwal wetland		N	Range	Minimum	Maximum	Sum	Mean
		Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
Direct value (Ksh)	Economic	60	100,000	10,000	110,000	4,650,000	77,500
	Recreational	48	100,000	10,000	110,000	2,870,000	59,792
	Nutritional	25	80,000	30,000	110,000	1,930,000	77,200
	Medicinal	5	10,000	10,000	20,000	8,000	1,600
	Water	49	90,000	20,000	110,000	3,720,000	75,918
Indirect value (Ksh)	Education and research	12	70,000	20,000	90,000	680,000	56,667
	Flood control	25	20,000	10,000	30,000	480,000	19,200
	Air purification	26	20,000	10,000	30,000	440,000	16,923
	Nutrient retention	7	20,000	10,000	30,000	130,000	18,571
	Socio-cultural	10	10,000	10,000	20,000	12,000	1,200
Option value	117	90,000	10,000	100,000	7,330,000	62,649	
Bequest value	80	40,000	10,000	50,000	2,090,000	26,125	
Existence (Ksh)	123	80,000	10,000	90,000	6,900,000	56,097	

### Direct Value of Kingwal Wetland Services and Goods

Direct services and/or goods obtained by local people from Kingwal wetland are economic, recreational and water benefits. The average monetary value per year that respondents were WTP for direct goods and/or services obtained from Kingwal wetland are: economic benefits - Ksh 77,500; nutritional benefits - Ksh 77,200, recreational benefits - Ksh 59,792;

medicinal benefits - Ksh 1,600 and water benefits - Ksh 75,918. Overall, results showed that Ksh 292,010 (USD 2920.1) was to be paid by the local people for direct values obtained.

### Indirect Value of Kingwal Wetland Services and Goods

Indirect services and/or goods obtained by local people from Kingwal wetland are flood control, air purification, socio-cultural and education, and research benefits. The

average monetary value per year that respondents were WTP for indirect goods and/or services obtained from Kingwal wetland are: flood control - Ksh 19,200; air purification - Ksh 16,923; nutrient retention - Ksh 18,571; socio-cultural - Ksh 1,200 and education and research benefits - Ksh 56,667. In total, respondents were willing to pay Ksh 112,561 (USD 1125.60).

#### **Option Value of Kingwal Wetland Services and Goods**

Over forty eight percent of respondents (48.7%) were WTP money in order to obtain goods and services they get from the wetland in future. The average value they were WTP for this was Ksh 62,649.

#### **Bequest Value of Kingwal Wetland Services and Goods**

Over 33.3% of the respondents were WTP money in order to ensure that future generations obtain goods and services from the wetland. The average value they were WTP for this was Ksh 26,125.

#### **Existence Value of Kingwal Wetland Services and Goods**

In addition, 51.3% of the respondents were WTP money in order to ensure that the wetland's natural beauty is preserved for a long time. The average value they were WTP for this was Ksh 56,097.

Therefore, the mean household WTP per annum for Kingwal wetland's benefits obtained by summing up all the wetland values was Ksh 549,442 (USD 5494.42).

From the foregoing results, it is evident that the direct value (Ksh 292,010) is the highest followed by the indirect value (Ksh 112,561), option value (Ksh 62,649), the existence value (Ksh 56,097) and the least is the bequest value (Ksh 26,125).

From the study results, the estimated economic value of Kingwal wetland is Ksh. 549,442 (USD 5440.02) or Ksh 2012.6/ ha per year. These findings disagree with those of Oduor *et al.* (2015) who reported that Nyando wetland which is 3600 km<sup>2</sup> had an estimated economic value of Ksh 143.4

billion (USD 1.5 billion) or Ksh 6 million/ha per year. This may be attributed to the value of resources like crops and their products, fodder, fish and water which is high demand, and the fact that the researchers used market prices of the resources derived from Nyando wetland as compared to the current this study where the researcher used only the CVM which involves the respondent's WTP based on approximation and is affected by various factors like income level of the respondents and distance from the wetland among others.

Respondents in this study were WTP a higher value for the direct benefits than the indirect benefits. This may be due to the fact that most direct benefits are tangible, easily seen and extracted as compared to the indirect benefits which may not be physically felt. Similar findings have been reported by Kakuru *et al.* (2013) and Oduor *et al.* (2015). In the research by Kakuru *et al.* (2013) findings showed that direct benefits contributed 83.3% to the total economic value of goods and services derived from the wetlands.

#### **CONCLUSIONS AND RECOMMENDATIONS**

Wetlands are seen as resources of no value and this has resulted in their continuous destruction. However, this study has revealed that Kingwal wetland has an economic value of Ksh 549,442 meaning that it contributes to the economy of the local people, regional, national and international level at large. The study recommended that:

- (i) There is a need to raise awareness regarding the economic worth of the benefits of wetlands to the people.
- (ii) The findings of this study should be disseminated to the users of wetland resources, planners and conservationists so as to promote their knowledge of the economic value in order to exert their

endeavors in sustainable supervision of the vital resources by coming up with approaches to maintain the wetland benefits to the public.

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