AN ECONOMIC VALUATION OF KINGWAL WETLAND'S BENEFITS AND COSTS TO THE LOCAL PEOPLE, NANDI COUNTY, KENYA.

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DECLARATION

DECLARATION BY THE CANDIDATE

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DEDICATION

I dedicate this report to my father, my departed mother, husband, siblings and daughters for their moral and spiritual support.

ABSTRACT

Wetlands are important ecosystems that support biodiversity and livelihoods. This study was conducted in and around Kingwal wetland located in Nandi County, Kenya in January and February, 2018. Besides the wetland providing economic benefits among others to the local people, it also brings costs to the people which have facilitated various disadvantages leading to its destruction. Despite this no comprehensive research has been done to analyze and document its benefits and costs to local people, as well as the wetland's economic value yet this is necessary to enable people understand the wetland's importance to them so as to minimize its destruction and hence this study was necessary. The main objective of the study was to carry out an economic valuation of the wetland's benefits and costs to the local people. The target population incorporated local residents living around the wetland, area chiefs/sub chiefs, staff from KWS, NEMA and Nandi County officials. Stratified random sampling was used to divide the study area into three namely upper, middle and lower Kingwal. Systematic random sampling was employed to pick respondents in upper and lower Kingwal while simple random sampling was used in middle Kingwal. In total, 240 respondents were given questionnaires to fill. Purposive sampling was used in selecting key informants for interviews. Data was collected using questionnaires, interviews, focus group discussions and observations. Data were analyzed using descriptive statistics, chi-square and logistic regression tests. Results showed that 88.3% (χ^2=141.067, df=1, p<0.001) of the respondents derived various benefits from Kingwal wetland including economic (58.3%), water (34.6%) and recreation (30%) benefits. Costs incurred by local people included crop damage by wildlife (43.7%) and flooding (32.9%). Results of the logistic regression showed that part of Kingwal inhabited by respondents (B= -0.739, df=1, p=0.005); distance from the wetland (B= -0.275, df=1, p=0.028) and average income (B= -0.643, df=1, p<0.001) influenced respondent's WTP. 51.2% of the respondents were willing to pay for benefits they derived from the wetland. The mean household WTP per annum for Kingwal wetland's benefits was Ksh. 549,442 (USD 5494.2). The major threats to conservation of Kingwal wetland are eucalyptus plantation (78%) and poaching (72%). A significant proportion (47.5%) of respondents indicated that fencing around the wetland can help control the movement of wild animals to and from people's farms. It is recommended that both the county and national governments formulate and implement policies to regulate human activities in and around the wetland. Further studies should be done on multi-analysis of Kingwal wetland's economic value using more than one method valuation.

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LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

CBC	Community-based Conservation
CBD	Convention on Biological Diversity
CV	Contingent Valuation
DNR	Department of Natural Resources
KFS	Kenya Forest Service
KNBS	Kenya National Bureau of Statistics
KSCTF	Kingwal Swamp Conservancy Trust Fund
KWS	Kenya Wildlife Service
MEMR	Ministry of Environment and Mineral Resources
NEMA	National Environmental Management Authority
NGO	Non-governmental Organization
NRF	National Research Fund
NUV	Non-use Value
RAMSAR	Convention on Wetlands of International Importance
TEV	Total Economic Value
UV	Use Value
WTA	Willingness to Accept
WTP	Willingness to Pay
WWF	World Wide Fund for Nature

OPERATIONAL DEFINITION OF KEY TERMS

Benefit: Is something good gained or received (Robinson and Davidson, 1997). In this study, benefits will refer to the advantages that accrue to local residents from Kingwal wetland including resources and services obtained. It is used interchangeably with goods and/or services.

Bequest Value: is the worth of maintaining a natural or historical resource for use by the upcoming generation

Contingent Valuation: Is a method whereby people are asked to indicate their Willingness To Pay (WTP) for a given ecosystem service and/or their Willingnes To Accept (WTA) as compensation in case of loss of a given ecosystem service (a service can be a benefit, cost or loss of the benefit) or WTA as compensation in case of losses incurred due to the presence of an ecosystem service.

Existence value: The worth of resources as well as their elements meant to preserve their nature regardless of present and upcoming possible uses (Emerton, 2016).

Loss: The bad effects of something" (Robinson and Davidson, 1997). In this study, it implies the losses incurred by the local people due to the presence of Kingwal wetland and the wildlife it accommodates.

Non-use value: Is an economic/monetary worth a person places on a resource to enhance protection of the resource for future use by the current and/or future generations or to preserve its natural existence. Non-use values are referred to non-use because people valuing them may not use the resource but are willing to pay for it (Schopp and Pendergrass, 2003).

Option value: is the worth put on preserving wetland places, species as well as genetic materials to serve for future (Emerton, 2016).

Social cost: It is a bad effect that an activity or a system has on people, society or environment.

Threat: Is defined as the possibility of trouble, danger or disaster (Hornby *et al*., 2010). A threat has also been defined as "a sign that something dangerous or unpleasant is or may be about to happen," and/or "a source of danger" (Robinson and Davidson, 1997). In this thesis, it is used to refer to sources of dangers to Kingwal wetland that degrade it if measures are not developed to protect it from dangers.

Total economic value: is the full financial contribution of a resource/system to the society (Barbier *et al*., 1997)

Use value: Is an economic/monetary worth a person places on a resource which is used directly or indirectly.

Valuation: Is an assessment of the monetary worth of something especially from an expert or authority (Robinson and Davidson, 1997). In this thesis it is used to imply the assessment of the monetary value of the benefits derived by local people from Kingwal wetland.

Value: It is the worth of something in monetary terms or other goods which can be exchanged with it or the feature of being helpful or essential (Hornby *et al*., 2010). Environmental and natural resource values are divided into use and non-use values. In this thesis, value is used interchangeably with benefit since both mean the goods and services obtained from natural resources.

Wetland: Is an area covered permanently, occasionally or periodically by fresh or salt water up to a depth of 6 meters (Micheals, 2013). Wetlands are also areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters and "may incorporate riparian and coastal zones adjacent to wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands" (Alexander and Mcinnes, 2012; Ramsar Convention Secretariat, 2013).

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

A wetland has been defined differently by different people. The RAMSAR Convention and others have defined wetlands as:

‘‘areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters” and “may incorporate riparian and coastal zones adjacent to wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands” (Alexander & Mcinnes, 2012; Ramsar Convention Secretariat, 2013).

Wetlands have characteristics that differentiate them from other ecosystems and include; the presence of water at a particular period of or throughout the year, specific soil particularly hydric soil and plants (hydrophytes) and animals adapted to aquatic conditions (MEMR, 2012). The conditions that lie between terrestrial and aquatic environmental conditions dictate the kind of flora and fauna found within them (Alexander & Mcinnes, 2012).

There are various types of wetlands. These include: rivers, lakes, coastal wetlands (Griffin, 2012), estuarine, marine, riverine, palustrine and lacustrine (Marti, 2011). Other examples include sandy shores, estuary waters, brackish/freshwater lakes, shallow

marines, seasonal freshwater marshes, permanent rivers (Griffin, 2012) as well as coastal mangrove wetlands and Kingwal and Saiwa swamps among others in Kenya.

Wetlands are very important and useful ecosystems (Baral *et al*., 2016) that should be effectively managed and conserved to meet the needs of the present and future generations. Due to their importance as wildlife habitats for resident and migratory wildlife species especially waterfowls, the Convention on Wetlands of International Importance (RAMSAR) was developed in 1971 and put in force in 1975 in order to ensure proper wetland conservation by protecting them from threats.

Generally, wetlands are widely distributed globally. The area occupied by wetlands throughout the world has been approximated to range between 8.3 million km^2 and 10.1 million km^2 (Lehner and Doll, 2004). In Kenya, the area covered by wetlands is roughly 14,000km^2 (Macharia *et al*., 2010; Lesiyampe, 2018).

Wetlands are found in different forms depending on climatic and landscape factors in different areas. In deserts and semi-desert areas like the Sahara, they are found as inland salt flats; in humid, cool areas, they are found as bogs and fens, and in temperate, subtropical and tropical coastlines, they exist as salt marshes and mangrove swamps (Mitsch and Gosselink, 1986). In the United States of America, examples of wetlands found include the Florida saw grass Marsh, Pacific Coast estuaries, California internally drained wetlands and the mangroves on the Pacific side of Central America. In Europe, wetlands found here include flooded plains and coastal shallows, among others. In Asia, there are monsoon wetlands of Bangladesh, flooded plain estuaries and mangrove wetlands in China, coral reef estuaries, long coastline shallow lagoons and equatorial

mangroves among others. In Australia, there is Darling and Murray floodplains in the tropical North, lagoons, mangroves and brackish lakes in Pacific Island of Australia. In Africa, we have floodplains of Senegal, Lake Chad, Okavango Delta, River Nile and Lake Victoria basin. In Kenya wetland areas include the coastal coral reefs and mangroves in the coastal region, Saiwa, Yala, Tana River Delta and Kingwal wetlands among others.

Wetlands provide goods and services to people living around them as well as those far away from them (Baral *et al*., 2016). Services provided include nutritional, water, herbal medicine and building materials (MEMR, 2012; Terer *et al*., 2012 cited in Mulei *et al*., 2014). Despite this, wetlands may also bring some losses to people living around them and these include covering land that people believe could be used for other important purposes like farming and human settlement. Animals inhabiting wetlands also cause human-wildlife conflicts by damaging people's crops, competing over pasture with domestic stock and spreading diseases.

Kingwal wetland is one of the wetlands found in Kenya that has potential to provide most of the aforementioned wetland benefits to the local community living around it including recreational benefits such as viewing of wild animals like the Sitatunga antelopes, foxes, mongoose and ant bears; water for domestic purposes; watching water and terrestrial birds; nature walks through reeds, papyrus and water lilies; fishing; educational and research benefits among others.

In spite of the foregoing, benefits of most wetlands including Kingwal wetland have not been analyzed to enable local people to understand the importance of conserving the wetlands. This lack of knowledge has led to the destruction of most wetlands including

coastal wetlands due to pressure from increasing human activities. To mitigate and reduce the threats and their impacts on the wetland and its resources, there was need for the researcher to undertake an economic valuation of Kingwal wetland's benefits to the local people with a view of making appropriate recommendations that can enhance the wetland's conservation for the benefit of the local people and Kenya at large. It is also envisaged that findings of this study will be used by policy and decision makers in coming up with effective measures to conserve and protect Kingwal wetland from unsustainable human activities that lead to its destruction and degradation.

1.2. Statement of the Problem

It is widely documented that wetlands provide many benefits to wildlife and people living around them. Wetlands also bring some costs (problems) to local people which have contributed to wetland destruction by people. If the destruction continues due to pressure from various human activities, this will result in the loss of most valuable benefits wetlands provide to people (Alexander & Mcinnes, 2012). Despite this, wetland benefits have not been evaluated in monetary value in Kenya to indicate their importance and/or significance to the local people. Kingwal wetland is one of the wetlands providing goods and services to local people including recreational benefits such as viewing of wild animals such as the Sitatunga antelopes, foxes, mongoose and ant bears; water for domestic purposes; watching of water and terrestrial birds; nature walk through reeds, papyrus and water lilies; fishing; educational and research benefits among others. Local people also incur some costs from the wetland including crop damages caused by wild animals among others. Despite this, no comprehensive research has been done to document and analyze the economic value of Kingwal wetland's benefits to the local

people. This study was undertaken to document and analyze the economic value of Kingwal wetland's benefits to the local people to enable conservationists and the local people come up with effective measures to sustainably manage and conserve it so as to increase its benefits and reduce the costs to the local people.

1.3 Objectives of the Study

1.3.1 Main Objective

To carry out an economic valuation of Kingwal wetland's benefits and costs to the local people.

1.3.2 Specific Objectives

a) To determine the benefits and costs of Kingwal wetland to the local people.

b) To assess the influence of socio-economic factors on the households' willingness to pay for benefits derived from Kingwal wetland.

c) To determine the estimated economic value of Kingwal wetland.

d) To determine the threats facing Kingwal wetland.

e) To establish the measures needed to mitigate the threats facing Kingwal wetland.

1.4 Research Questions

a) What benefits and costs are experienced by local people from of Kingwal wetland?

b) What is the influence of socio-economic factors on the households' willingness to pay for benefits derived from Kingwal wetland?

c) What is the estimated economic value of Kingwal wetland?

d) What threats are faced by Kingwal wetland?

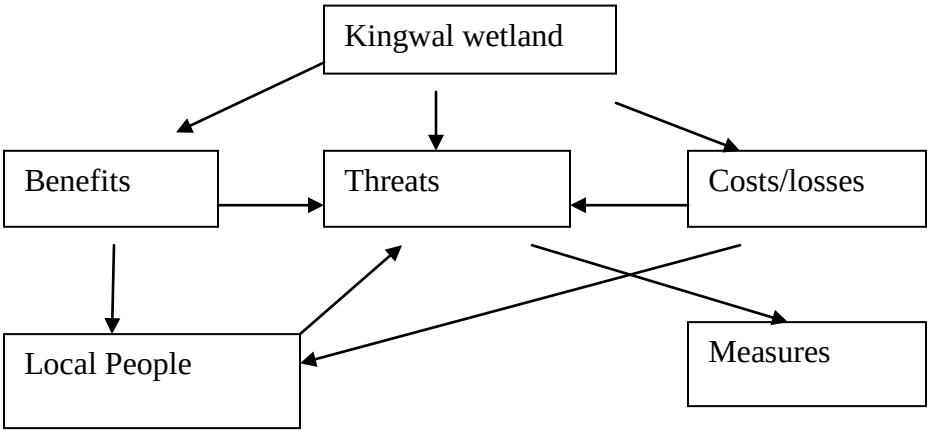
e) What measures have been adopted to mitigate the threats facing Kingwal wetland?

1.5 Justification and Significance of the Study

Kingwal wetland is one of the important wetlands in Kenya and has been documented to have the highest number of Sitatunga antelopes in Kenya (Magut, 2014). The Sitatunga antelopes are rare animals which are currently threatened and are almost driven to extinction. Besides the Sitatunga there other resources found within and around the wetland among them plants, water and clay. To arrest this, there was need 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 measures to promote sustainable management of the wetland and its resources like the Sitatunga. Besides this, benefits accruing from most wetlands in Kenya including Kingwal wetland have not been determined in monetary value yet this is very important tool for both conservationists and the local people. The 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 conservation of wetlands and other protected areas. This will in turn promote sustainability of the wetlands for the survival of the wildlife found therein. The

thesis will be a reference for researchers and scholars undertaking similar or related studies.

1.6. Conceptual Framework



The local people derived benefits from Kingwal wetland. They also incur costs from the wetland. Unsustainable extraction of the benefits results to threats facing Kingwal wetland. However, when people incur some costs/losses from the wetland for example crop damage, they retaliate by killing the wild animals causing the losses, consequently threatening them. Mitigation measures are necessary to mitigate the threats facing the wetland.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

Due to scarcity of knowledge on the value of wetlands in the past, they were regarded as wastelands and therefore stumbling blocks to expansion of economies of countries (Conathan *et al*., 2014) and should have been cleared or drained and used for other purposes such as human settlement, livestock and/ or crop farming, establishment of industries among other human activities (Barbier *et al*., 1997). Currently, several people in the world have acquired knowledge from learning institutions, published information in books and the internet about their own experiences or those of friends on the importance of wetlands. Based on this, a number of wetland ecologists have documented information on wetland benefits to both people and wildlife. Information on various aspects of wetlands are discussed in subsequent sections below.

2.2. Benefits of wetlands to wildlife and people

2.2.1. Environmental/Ecological Benefits

a) Wildlife habitats

Many plants and animal species adapted to water saturated conditions inhabit wetlands. They include amphibians, birds and fish (Macharia *et al*., 2010, Griffin, 2012) mammals, reptiles and some species of insects depend on wetlands for food, cover and breeding. Wetlands are also very important habitats for rare and endangered wildlife animal species

and some endemic wildlife species (Mohd *et al*., 2009). In addition, wetlands provide places for growth of plants (Macharia *et al*., 2010) including reeds, sedges, water lilies, peats, grasses, medicinal plants. The importance of wetlands as wildlife habitats and areas of some migratory species especially waterfowls that depend on wetlands for resting, breeding and sheltering led to the development of The Convention of Wetlands of International Importance (RAMSAR Convention) in 1971. The Convention was put into force in 1975 with the objectives of controlling the loss of wetlands and ensuring that wetlands are conserved (Griffin, 2012). For instance, Jagadishpur Reservoir catchment area, a manmade wetland in Nepal provides habitat for a number of migratory waterfowl species (Baral *et al*., 2016). Likewise, the Gulf of Mexico coastal wetlands offer a habitat for juvenile shrimp (Engle, 2011). Correspondingly, Yala swamp in Kenya provides a habitat for cichlid fish (Agatha and Romulus, 2014).

b) Carbon sequestration and pollutants removal

Wetland plants absorb carbon dioxide and carbon monoxide gases from the surroundings thus purifying air released by human beings and animals (Conathan *et al*., 2014; Griffin, 2012; Kakuru *et al*., 2013; Marti, 2011). For instance, Jagadishpur Reservoir catchment area in Nepal provides carbon sequestration service (Baral *et al*., 2016). Wetlands also absorb many pollutants and therefore diminish their effects on people (Conathan *et al*., 2014). For instance, constructed wetlands near Sacramento-San Joaquin River system of California's Central valley remove pollutants from agricultural run-off including nitrates from agricultural chemicals used in farms (Dahlgren *et al*., 2012) hence minimizing pollutants reaching Sacramento-San Joaquin River.

c) Flood control

By slowing down the rate/speed of running water and absorbing rain water (Holden, 2008 cited in Momanyi and Ariya, 2015), wetlands minimize flooding (Griffin, 2012; Kakuru *et al*., 2013; Marti, 2011; Salem and Mercer, 2012) and hence shelter people living close to wetlands from floods and their negative impacts. For example, Nakivale, Mende, Mabamba, Limoto, Rucece and Gogonyo wetlands in Uganda are reported to control floods from affecting local people living adjacent to them (Kakuru *et al*., 2013). Likewise, Lake Victoria in Kenya controls floods since it has depressions (Kipkemboi *et al*., 2007) that retain flood water from damaging people and their properties.

d) Storm protection

A number of wetlands especially those found in forested areas prevent storms from bringing adverse effects to people and their properties**.** They also shield storm surges (Conathan *et al*., 2014) from reaching people's houses and other properties and harming them. For instance, the impacts of hurricanes on coastal communities in United States are reduced by the presence of coastal wetlands (Anderson *et al*., 2008).

2.2.2. Economic benefits

The national, regional and global economy has been documented to be boosted by wetlands in many ways. Because of natural resources including wetlands, developed countries are at a stable state while developing countries are improving their economic status using the natural resources (Agatha and Romulus 2014). Most East African countries depend on wetlands in promoting their economy (Mwakubo and Obare, 2009

cited in Kakuru *et al*., 2013). For instance, The eight Ugandan wetlands; Nangabo, Mabamba, Mende, Rucece, Lake Nakuwa, Limoto, Gogonyo and Lake Nakivale support the country's economy (Kakuru *et al*., 2013).

Some wetlands such as mangroves supply raw materials like timber, honey, firewood and other raw materials to industries and/or directly to local people who use them directly (Salem and Mercer, 2012), pastures for livestock grazing and therefore act as a source of income and food (Kakuru *et al*., 2013; Schyut, 2005 cited in Moqekela, 2016 and Oduor *et al*., 2015) to people. Through providing these services, wetlands are improving people's standard of living and therefore boost the nation's economy. Nearly all wetlands in Uganda are reported to highly contribute to the country's economy (Namulema, 2015) through provision of economic resources like grass for thatching and grazing for instance Lake Nakivale wetland (Kamukasa and Adonia, 2013). Similarly, Yala swamp in Kenya provides materials like papyrus and reeds for thatching, making mats, chairs and doors used directly by the local people and/or can be sold to other people (Salem and Mercer, 2012).

2.1.3. Recreational and Touristic benefits

Due to the fact that wetlands are habitats for wild animals and plants including water birds, fish, reptiles, amphibians and mammals, they support many tourism activities (Kakuru *et al*., 2013; Momanyi and Ariya, 2015) and recreational activities including photography, bird watching, swimming, canoeing, snorkeling, fishing, sailing and hunting which are undertaken within and around them by different people. Mangrove wetlands are sites encouraging hiking, bird watching among other tourism practices

(Salem and Mercer, 2012). Similarly, Wondo Genet wetland forest ecosystem in Ethiopia provides touristic services such as hotel and hospitality, bird watching, mountain hiking, and site seeing (Mohammed, 2016). Likewise, Lake Nakuru National park provides recreation and touristic services like watching of birds particularly flamingos and viewing of other wildlife found within and around the park which were reported to cost about 7.5-15 million USD (Navrud and Mungatana, 1994).

2.2.4. Health Benefits

a) Nutritional benefits

Various wetlands provide food (Marti, 2011; Terer *et al*., 2004 cited in Momanyi amd Ariya, 2015) which are consumptive benefits for human consumption. Many fish found in wetlands are cheap sources of protein (Kakuru *et al*., 2013) to people. For instance, fishes found in Lake Chilwa in Malawi, the Lukanga swamps in Zambia (Moqekela, 2016) and Yala swamp in Kenya (Agatha and Romulus, 2014) provide cheap and readily available protein to people. Other edible products extracted from wetlands include wild fruits and vegetables which are source for instance in Mende, Mabamba and Gokonyo wetlands of Uganda (Kakuru *et al.*, 2013).

b) Water

Water is very essential for the health of every living thing and therefore it should be continually supplied. Wetlands enhance continuous supply of water to rivers, streams and lakes by retaining surface water during rainy seasons (groundwater recharge) and supplying it to rivers and lakes during dry seasons (groundwater discharge) where it is

used for household and manufacturing purposes (Moqekela, 2016). Therefore, wetlands ensure that people receive constant supply of water in all seasons for irrigation of agricultural lands (Griffin, 2012), domestic use and drinking by livestock (Kakuru *et al*., 2013). For example, Lake Nakivale wetland in Uganda provides water for domestic use by local people and drinking by wild and domestic animals (Kamukasa and Adonia, 2013). Likewise, Lake Naivasha in Kenya provides water for use by local people for irrigation of farming lands, drinking and domestic use. Water from the lake is also used in Olkaria Geothermal Power station (Beicht and Harper, 2002 cited in MEMR, 2012)**.**

c) Medicine

Another health benefit derived from wetlands is herbal medicine (Marti, 2011; Salem and Mercer, 2012; Terer *et al*., 2004 cited in Momanyi and Ariya, 2015). For instance, some wetlands in South Orissa are reported to consist of plants that are used as medicine to cure various diseases (Panda and Misra, 2011). Likewise, medicinal plants like *Ipomoea aquatica forsk* whose leaves are reported to prevent bleeding during child delivery when consumed orally are extracted from floodplains in Subansiri and Ranga river in India (Sarmah *et al*., 2013).

2.2.5. Other benefits

Other benefits derived from wetlands include soil erosion control (Marti, 2011), sites for performing religious and cultural practices like prayers and circumcision (Terer *et al*., 2004 cited in Momanyi and Ariya, 2015) and education and research benefits (Marti, 2011).

2.3 Categories of Benefits Derived from Wetlands Based on Monetary Valuation

Natural resource economists have classified natural resource benefits into two namely use and non-use values based on monetary/economic valuation.

Use values which incorporate direct use value, indirect use value and option value; and non-use values which include bequest and existence value. Direct use value is the worth of natural resources that can be directly consumed and most of the resources have market price for instance fish, recreation, wood among others. Indirect value is the worth of the functional use of natural resources for instance flood control carbon sequestration among others. Option value is the monetary worth people attach to natural resources for own use in future and not currently. Bequest value is the monetary worth people are willing to pay for resources to be used in future by the future generation (Bateman *et al*., 2003 cited in Emerton, 2016). Existence value is the monetary worth people are willing to pay in order to ensure that a natural resource remain the way it is for a long time.

Wetland direct use values include recreational services and goods, nutrition, and extraction of natural resources among others while wetland indirect use value include flood control, storm protection, continuous provision of water, carbon sequestration, stabilization of climate and reducing of global warming among others (Brander *et al.*, 2006). Option value is the future direct and indirect value of a natural resource and includes future preserved biodiversity and conserved habitat while existence value is the value of persistent existence of species, habitat, genetic and ecosystem (Jantzen, 2006). Based on the foregoing, it is hypothesized that Kingwal wetland confers the above values to local people as well as other users who visit the area.

2.4 Costs Incurred by People from wetlands

Despite the fact that wetlands like other protected areas provide many benefits to people, people also incur some losses/problems due to the presence of wetlands around and within areas they inhabit for example, interaction between wildlife and people have been reported to results in losses/problems manifested through human-wildlife conflicts (Nelson *et al*., 2003 cited in Wahungu and Sitati, 2006). Hence, many mammalian species including antelopes, lions, leopards, rodents, elephants, buffalos, zebras, hyenas and hippopotamus are common problem animals in nearly all protected areas (Saj *et al*., 2001 cited in Wahungu and Sitati 2006). Wetlands are part of these protected areas and accommodate some of the aforementioned problem animals and people living around wetlands often incur various social costs due to these.

Crop destruction is one of the social costs incurred by local people living within and/or around protected areas including wetlands (Hartter, 2009; Karanth *et al*., 2013). Many wild animals found within protected areas come out of these areas in search of resources like grass and water. Some feed on people's crops hence bringing losses to the people. People living adjacent to Kibale National park in Uganda for instance face the problem of crop damage by primates and elephants (Hartter, 2009).

Livestock injury or death is another social cost incurred by local people living adjacent to protected areas (Wahungu and Sitati, 2006). This arises due to livestock grazing within protected areas and therefore gets close to wild animals some of whom are carnivores among them lions, leopards, hyenas and jackals. Some local people in Botswana for instance face livestock predation from hyenas and lions (Kgathi *et al*., 2012). Similarly,

the Maasai people living around Amboseli ecosystem face the problem of livestock predation by jackals, hyenas, lions, cheetahs and leopards (Moses *et al*., 2014) leading to many losses.

Battling over resources like water and pasture is another problem faced by local people living within and around protected areas. In Lake Ol'bolosat catchment area found in Nyandarua County in Kenya for instance, cattle and hippopotamus battle over water and grass and this has led to drying up of the area near the wetland (Mathenge, 2013).

Wetlands cause and/or spread diseases through harbouring disease carrying organisms. For example, Lorian swamp in Kenya harbors the female anopheles mosquito spreading malaria and snails transmitting bilharzia diseases (Hughes and Hughes, 1992 cited in MEMR, 2012). Likewise in areas near wetlands in South Africa, malaria disease is common due to the existence of breeding areas for mosquitoes that spread it (Malan *et al*., 2009). Communities living in these areas incur a lot of losses on treatment, hospitalization and purchase of drugs.

2.5. Threats Facing Wetlands

Wetlands and other protected areas in the world face threats from people due to human population pressure and activities they engage in. Increases in human population have forced people to encroach on these areas and also undertake economic activities. Encroachment on protected areas has resulted in increased interaction between people and wild animals leading to human-wildlife conflicts. Likewise, unsustainable utilization of the wetlands due to the perception that they are of low or no economic value has led to destruction and degradation of these areas (Kirsten, 2005 cited in Wasswa *et al*., 2013).

Consequently, a number of wetlands and protected areas are being destroyed due to human activities, wetland reclamation and transformation/conversion (Wang *et al*., 2008), development projects (Moqekela, 2016), urbanization, agricultural based activities, extraction of papyrus and soil for brick-making (Wasswa *et al*., 2013). In Kenya wetlands faced with such threats include Nyando floodplain wetland (Rongoei *et al*., 2013), Lake Victoria, Migori river, River Sondu-Miriu, Lorian swamp, Shompole swamp, Yala swamp, Lake Nakuru, Lake Naivasha, Lake Turkana, Lake Magadi, Lake Baringo, Lake Ol Bolossat, Habasweni swamp among others (MEMR, 2012).

Like many protected areas, wetlands globally are facing serious threats from human activities (Daryadel *et al.*, 2014). These activities include road developments, fishing industries, human settlements, and agriculture (Salem and Mercer, 2012) which involves use of pesticides and other chemicals which cause water pollution, drainage and diversion of water for other uses like industrial developments, mining of sand and brick production (Wasswa *et al*., 2013). Wetlands which have not been converted are facing other threats like waste disposal resulting in wetland environmental pollution, over exploitation of their resources like timber, wood (Salem and Mercer, 2012) overfishing; poaching of wild animals; human encroachment and draining of water away into rivers. All these activities are as a result of ignorance and lack of appreciation of the values wetlands provide to people and this has consequently led to degradation, drainage and conversion of wetlands to other land use activities (De Groot *et al*., 2006). Poor land use practices like crop farming, urbanization and human settlement around Lake Nakivale wetland in Uganda for example has led to land degradation, wetland encroachment and disappearance of wildlife habitats (Kamukasa and Adonia, 2013). Similarly, Yala and

Nyando swamps in Kenya have been encroached on by human settlements and agriculture (MEMR, 2012) which have led to its degradation.

The introduction of non native species also referred to as foreign /invasive/alien species is another threat facing wetlands. More often, this is done with an intention of increasing food resources for human consumption, increase target species for recreational, hunting or aesthetic purposes or as a biological control method to consume unwanted species (IUCN, 1999). Introduced species compete with native species for resources and since native species may not adapt quickly to changes in their habitat, their number decrease leading to reduction in their population and may be totally cleared. In 2010 for instance, the extinction of Aloatra Grebe in Madagascar accelerated following the introduction of the trout and salmon (Dolony *et al*., 2010). Similarly, the introduction of the Nile perch in Yala swamp has led to the decline of cichlid and other native fish species (Abila *et al*., 2008 cited in Agatha and Romulus, 2014).

Another threat to wetlands and their resources is overexploitation. Wakkersroom swamp in South Africa for instance has been degraded by mining while the Niger Delta in Nigeria has been degraded by inadequate planning and unsustainable exploitation and management of oil, and over extraction of fish and forest resources (UNEP, 2000 cited in Moqekela, 2016). Other threats to wetlands include poaching of some wild animals which is a serious threat to rare and endangered wetland animal species, overstocking of livestock (Barbier *et al*., 1997), use of chemicals including pesticides, insecticides and herbicides in crop farming, industrial pollution, mining, and overutilization by people (Wiscosin Wetlands Team, 2008).

Extraction of clay for brick making is another threat facing wetlands. It threatens not only wetlands but also soil, vegetation, air and the health of human beings (Khan and Vyas, 2008) through environmental pollution. In Kathmadu Valley (capital city of Nepal), extraction of soil for making bricks has cause air and soil pollution which has resulted in various human health effects including respiratory, eyes and nose problems (Sumar *et al*., 2013).

2.6. Measures Adopted to Mitigate Threats Facing Wetlands

To mitigate the threats facing wetlands and enhance their sustainability, wetland ecologists, conservationists and natural resource managers have documented some measures that have been adopted or have potential to mitigate threats facing wetlands.

The Convention of Wetlands of International Importance (Ramsar Convention) which was adopted in 1971 advocates for sustainable and wise use of wetlands in order to protect endangered and migratory wildlife including water fowls and other wildlife species found within them and forms the basis for the protection of wetlands in Kenya and the world at large. After its adoption, the Convention encouraged many projects including the designation of wetlands of international importance, launching of guidelines for the wise use of wetlands and the creation of guidelines for evaluating the economic value of wetlands among others (Griffin, 2012). A number of countries have also been issued with mechanisms to avert, lessen and restore wetland loss and degradation by the Ramsar convention (Alexander and Mcinnes, 2012). Other Conventions that have promoted sound management and sustainable conservation of wetlands include: the Convention on the conservation of European wildlife and habitats,

the Convention on Migratory species (Bern 1979 cited in Dolony *et al*., 2010) and the Convention on Biological Diversity (Nairobi, 1992 cited in Dolony *et al*., 2010). In addition, conservation organizations like the World Conservation Union, Birdlife International and Wetlands International (Griffin, 2012) have also been instrumental in promoting conservation and management of protected areas including wetlands.

The economic value of wetlands together with their ecological and socio-cultural benefits have been key in designing valuable measures for sound management of wetlands (De Groot *et al*., 2006). Further, public involvement in and local ownership of wetlands at local, regional, national and international level is another factor that has been incorporated in designing wetland management plans in order to enhance effective implementation (Ramsar, 2011) and minimize threats facing wetlands. This coupled with the participatory approach to wetland management has promoted support for wetlands.

Many developing and developed countries have enacted rules, regulations and laws that give emphasis on restoration of lost wetlands and protection of the restored and the existing ones. The Department of Natural Resource (DNR) in the state of Wisconsin in the United States of America for instance has set local, state and federal regulations which help reduce wetland losses by promoting the protection of existing wetlands and restoration of the lost ones (Wisconsin Wetlands Team, 2008). Astonishingly, the African continent depicted to be having many wetlands compared to other continents has fewer countries with sound national policies and laws that keep off wetlands from threats (McCartney *et al*., 2010 cited in Moqekela, 2016). Consequently, many wetlands in these countries continue to be destroyed, degraded, or converted to other uses including agricultural land.

To reduce the negative impacts of invasive/introduced foreign animal and plant species, some protected area managers including wetland managers have introduced other less destructive species to consume the more destructive invasive species. To lessen the population of invasive plants in Wisconsin wetlands, Department of Natural Resource for instance led conservationists in initiating the use of special purple loosestrife-eating beetles which proved effective in eliminating the invasive species (Wisconsin Wetlands Team, 2008). Likewise, *Cyrtobagous salviniae*, a small weevil from native weeds in Brazil has been used to clear the invasive pest *Salvinia molesta* in Australia, Africa and Asia which is an aquatic weed pest which had hindered the functioning of water bodies as sites for irrigation, food production and safeguarding of wildlife (Messing and Wright, 2006).

Another measure that has been adopted and is being applied is education to create awareness on benefits of wetlands to people (Daryadel *et al*., 2014). Conservation-based education helps in enhancing people's positive attitude and perception towards conservation of natural resources including wetlands. For instance, the educational programs organized in two highlands of Central Africa were reported to have been effective in promoting positive attitude and perceptions towards wetland conservation and minimizing threats facing them. This was shown by the different communities coming together in creating ecotourism (Macharia *et al*., 2010 cited in Wasswa *et al*., 2013). Community-based education programs helped enhance positive attitudes and perceptions towards the conservation of natural resources as reported by Wasswa *et al*. (2013). Likewise, education programs in Marine Protected areas have been shown to be

effective in promoting positive attitudes towards marine protected areas' conservation (Leisher *et al*., 2012)

2.7 Valuation of Wetlands Benefits

Literature reviewed revealed that the threats mentioned above among others come as a result of undervaluation (Ambastha *et al*., 2007 cited by Khan and Abbasi, 2015) and disapproval of the services wetlands provide to people (De Groot *et al*., 2006). If the degradation and destruction of wetlands continues due to pressure from human activities or due to undervaluation and disapproval, it will result in the loss of the valuable benefits/services wetlands provide to people (Alexander and Mcinnes, 2012). To avert this, an economic valuation of wetland values is necessary to ensure that sound decisions are made to promote effective conservation rather than drainage, degradation and diversion of wetlands for other purposes. This is because wetland monetary valuation is among the numerous methods of wetland assessment used in making intelligent conclusions about sound-use and sustainable management of wetland ecosystems (De Groot *et al*., 2006). This study thus undertook an economic valuation of Kingwal wetland to inform policy and decision makers on measures to be undertaken to sustainably manage the wetland and mitigate the threats faced.

Until recently, there was little and/or no knowledge on the economic valuation of natural resources including wetlands since it was difficult to put a monetary value on them due to lack of natural resource valuation methods and the fact that nearly all natural resources for instance mangrove wetland resources are not sold in the market and therefore most of them do not have a market price (Salem and Mercer, 2012). On the other hand, it has

been easier to define the monetary value for almost all manmade products due to the fact that most of them are sold in the market hence apply the use of market price. Despite this, natural resource conservationists have in recent years come up with ways of economically valuing natural resource benefits and costs which are documented in the Ramsar Convention and CBD as well as the World Conservation Union and other natural resource based organizations (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 show 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 these are subdivided into three; direct market, indirect market and survey-based valuation.

Manmade and some natural resources employ the direct market valuation method whereby the market price of the service/benefit/cost is applied. For fish, beef meat, wood, and vegetables which can be sold for instance, their market price can be used in valuing them while many other natural resources use indirect market valuation (also referred to as revealed preference) methods that entail 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).

Economic values of environmental and ecosystem goods and services have been mostly estimated by many economists using Contingent valuation method. Contingent means acceptance of an offer of property by someone and before buying it and has to check it to be familiar with its conditions and finally make a choice. Therefore 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 which can be a benefit, cost or loss of the benefit or WTA as compensation in case of losses incurred due to the presence of an ecosystem service. Contingent Valuation questions asked to determine the value of a service or good can be open-ended (continuous) or closed ended (discrete) (Zenh *et al*., 2011 cited in Sumukwo *et al*., 2012).

The Contingent Valuation method has been used widely both in developed and developing countries. It was first applied by Davis (1963) in his thesis research entitled ‘‘The value of outdoor recreation: an economic study of the Maine woods” (Carson and Hanemann, 2005). It was also used by De Groot *et al* (2006) in valuing the benefits derived from wetland ecosystem services. In Kenya, it has been used by Wasike (1996) in valuing the cost of water pollution control and water supply and by Akala (2001) in valuing forest resources found in Kakamega Forest. The CV method has been used by a number of environmental economists with success.

Being a valuation method which has been widely used with effectiveness, CV as a stated preference method will be applied in this study in valuing Kingwal wetland’s benefits like recreational, cultural, economic, nutritional, and educational benefits among others. It is because of its flexibility (Carson and 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 *et al*., 1999) that makes CV method the best alternative for this study unlike revealed preference methods which give the actual preference economically by estimating only the use value but not the non-use value. Likewise, since numerous observational data faces a lot of monetary difficulties this can

be evaded by using CV (Carson and Hanemann, 2005). Other stated preference methods are choice modeling, conjoint analysis and polychotomous choice although few studies have been done using these methods. However, the results when compared differed from those of same studies done using CV. For instance, Conjoint analysis gave estimates of WTP that were biased and respondents of the conjoint analysis have been described as showing lack of interest openly (Stevens *et al*., 1999).

In spite of the foregoing observations, it has been noted that contingent valuation has some disadvantages. One of these is that CV may come up with approximations that are not applicable to policy makers (Carson and Hanemann, 2005). However, this was overcomed in this study by preparing well designed questionnaires and interview guides in line with local and national authorities. Therefore, this study utilized CV due to its flexibility, unbiasness and its ability to estimate both the use and non-use values.

The logistic regression model was used to test the hypothesis as documented by Akala (2001). Logistic regression model is an analysis model which is useful in analysis of contingent valuation studies on mostly natural resources therefore demonstrating natural resources values to people. This ensures effective and sustainable conservation of the resources by people so as to increase their benefits and minimize threats facing these resources.

CHAPTER THREE

METHODOLOGY

3.1. Introduction

This chapter commences with a discussion on the study area. It is followed by information on the research design used, the target population and sample size, sampling procedures, data collection methods and finally data analysis and presentation techniques.

3.2. Study area

3.2.1. Size and Location

The study was conducted within and around Kingwal wetland located in Nandi County. The wetland is situated roughly 400km from Nairobi city (Momanyi and Ariya, 2015) and 25 Kilometers from Eldoret town along the Eldoret-Kapsabet road. It covers about 2.73km^2 as stated in the Nandi District Development plan 2002-2008 (Sitienei *et al*., 2012). It runs from Kiptenden through Kesses and Mosoriot towards Nandi North Forest in Mosop Constituency.

3.2.2. Topography, Geology, Drainage and soils

The topography of Nandi County is hilly with steep slopes bordering rivers and swamps (Lesiyampe *et al*., 2018). The wetland receives water mainly from Kesses River (MEMR, 2012) and streams and springs around Kesses area which flows from east and drains into Kingwal (Kimondi) River while flowing to the west (Momanyi and Ariya, 2015).

Volcanic rocks form the sides of the wetland which lies at about 1960 meters high (Lesiyampe *et al*., 2018). The soil within the wetland is clay.

3.2.3. Climate

Kingwal wetland and its surroundings receive rainfall between 1200-2000mm per annum (Lesiyampe *et al*., 2018). The area's average temperatures range from 15^{o} C to 20^{o} C during wet seasons and an average of 24^{o} C during dry seasons.

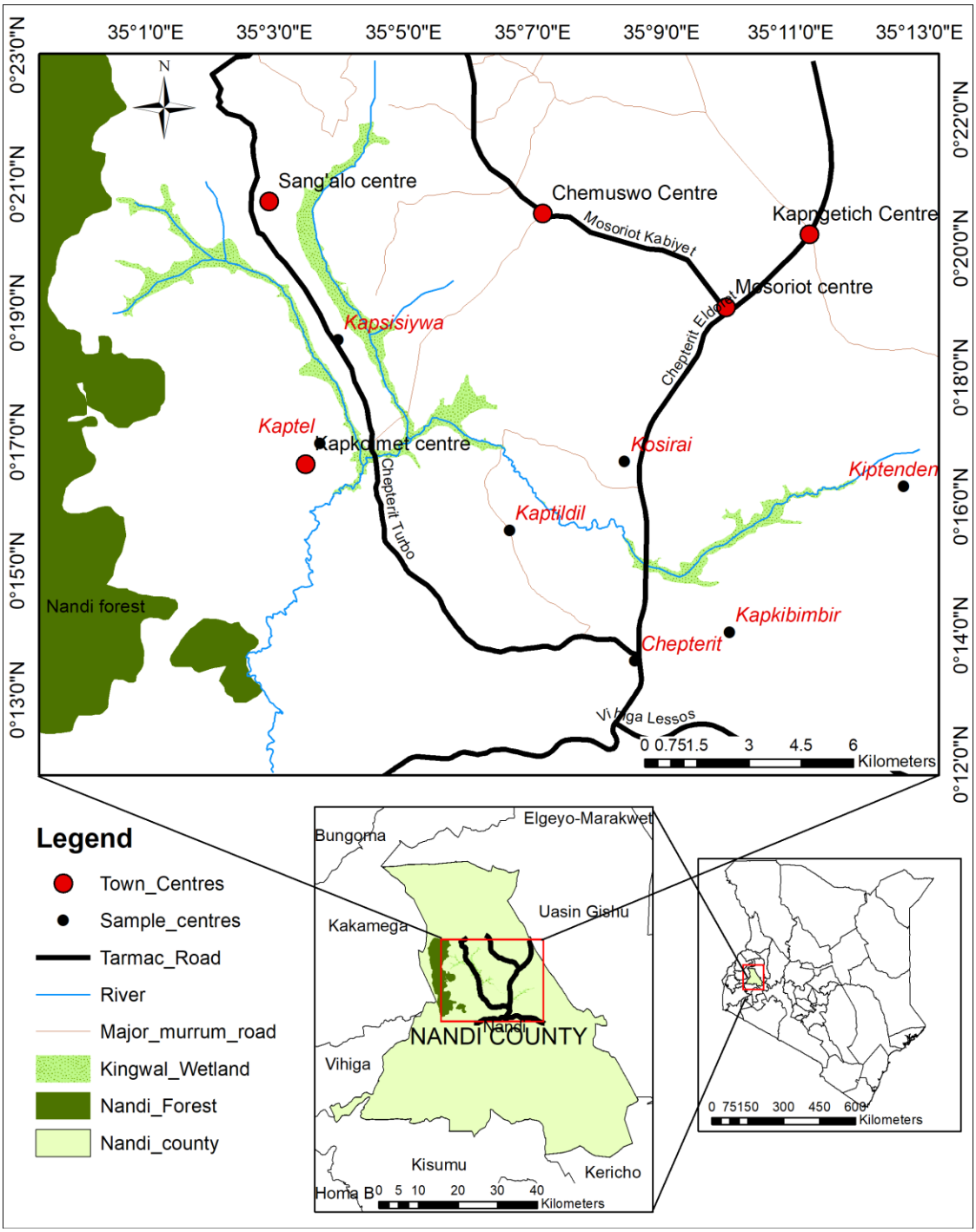


Figure 3.1: Map of Nandi County showing the location of Kingwal wetland (Source : Author, 2019)

3.2.4. Fauna and Flora

Kingwal wetland is inhabited by different wildlife including wild animals and plants. It is well known as habitat for the endangered Sitatunga antelope (*Tragelaphus spekei*). Other wild animals found in Kingwal wetland are mongoose, foxes, otters, and ant bears, birds like the cranes, snakes, frogs, and different species of fish. The wetland also harbors plants including trees, grasses, and shrubs (Sitienei *et al*., 2012), herbs, papyrus, sedges, reeds and water lilies.

3.2.5. People and Economic Activities

The area around Kingwal wetland is largely inhabited by the Nandi, a sub tribe of the large Kalenjin tribe. They practice economic activities like livestock keeping, brick making and agroforesty (Plates 1 – 3) in addition to growing crops such as maize.

Plate 1: Livestock Keeping (Source: Author, 2018)

Plate 2: Brick Making (Source: Author, 2018)

Plate 3: An Agro-forestry seedlings nursery (Source: Author, 2018)

Plate 4: Maize roasting (Source: Author, 2018)

Plate 5: Tea farming (Source: Author, 2018)

From the photographs above it is evident that Kingwal wetland is a significant resource to the local people living around it. The wetland sustains many economic activities undertaken by people around it among them livestock keeping, crop farming, brick making and agro forestry. These economic activities have an impact on the wetland (Ambasa, 2005).

3.3. Methods

3.3.1. Research Design

The study utilized the descriptive research design. The descriptive research design is a strategy that involves expressing the features/characteristics of a given place/group/person/thing. This research design was employed because the study is interested in describing the benefits, costs and threats facing Kingwal wetland and the measures adopted to mitigate the threats. In addition, the design was employed because

the study is a socio-ecological research involving the interaction between humans, the wetland and its resources including wildlife, and getting opinions from the local people using questionnaires, interviews and focus group discussions.

3.3.2. Target Population and Sample Size

The target population comprised of local people living around Kingwal wetland, as well as community and administration leaders and staff from the County government, Kenya Wildlife Service (KWS), Kenya Forest Service (KFS) and National Environmental Management Authority (NEMA).

To facilitate sampling and data collection, the study area was divided into three parts: upper, middle and lower Kingwal. Middle Kingwal cut across Chepterit and Kosirai location and its population was denser than upper and lower Kingwal. It covered the area within and around the main tarmac road that connects Kapsabet town to Eldoret town. Chepterit center is also found within this middle part. The main activities practiced by people living within middle Kingwal were activities done within Chepterit center including shop keeping, hair dressing, grocery operation, maize roasting among others. Lower Kingwal population is situated in the lower part towards Nandi north forest. It covers Kapsisiywa and Kaptildil locations near East Africa Baraton University. It is densely populated as compared with upper Kingwal but sparsely populated as compared to middle Kingwal. Most of the people occupying lower Kingwal rely on crop farming as a source of livelihoods. The upper Kingwal is situated in the upper side of Kingwal covering only Kiptenden location near Uasin Gishu county. It is sparsely populated as compared to upper and middle Kingwal.

In sample size selection, out of 2404 households situated close to the wetland (KNBS, 2009), 240 households were selected from the three zones and each head of the sampled household was given a questionnaire to fill. Ninety six respondents were drawn from middle Kingwal, eighty were drawn from lower Kingwal and sixty four were drawn from upper Kingwal based on the density of the population in every part. The sample size constituted 10% of the total population and conformed to what Mugenda and Mugenda (2013) suggested and indicated that a sample size can range between 10% to 30% for a population below 10,000. Six groups from the three parts of Kingwal were organized for focused group discussions. Respondents from community based organizations, Nature Kenya, KFS, KWS, and NEMA were interviewed as key informants.

3.3.3. Sampling Procedures and sample size selection

3.3.3.1. Questionnaires

Simple random sampling (Kothari, 2004) was used to select 15 respondents to fill 15 questionnaires (five from each part) to test the validity and reliability of the questionnaire. After pre-testing corrections were made to the questionnaire and the final corrected questionnaire was obtained as shown in Appendix I of this report. Systematic random sampling (Kothari, 2004) was then used in selecting respondents from upper and lower Kingwal whereby every fifth household was sampled and household heads given questionnaires to fill until a total of sixty respondents from upper Kingwal and eighty four from lower Kingwal was achieved. Simple random sampling was used in selecting ninety six respondents from middle Kingwal whereby the total households from the part obtained from area chief was used. The names of the households were noted down and 96

names were randomly picked from the list. From the selected names, respective household heads were given the questionnaires to fill. A higher percentage was taken from middle Kingwal because the population is dense since it borders Chepterit centre and is also close to the Eldoret-Kapsabet tarmac road compared to upper and lower Kingwal.

The different sampling procedures were employed in the different parts because the characteristics of populations in the parts were not the same. The upper and lower Kingwal is inhabited by the Nandi community, a sub tribe of the larger Kalenjin tribe practicing mainly crop farming. Due to the fact that they were having nearly same characteristics for instance in terms of language spoken and economic activities, it was necessary to skip some of them in order to obtain variety of information since if the neighbours were all interviewed, they might have given similar information since they share a lot of things in common. However, the middle Kingwal is inhabited by mixed tribes most of which came to the place temporarily to look for self employed jobs like selling of vegetables in groceries, maize roasting and selling, shop keeping, hair dressing, bricks making and selling among others. This is because middle Kingwal covered the area where Chepterit and Kosirai centres are and the main tarmac road from Kapsabet to Eldoret passes through it encouraging businesses. Being inhabited by different tribes with varying economic activities means their social characteristics differ making it fit for simple random sampling to be employed in collecting data using questionnaires since they have vary information about the wetland.

3.3.3.2. Key Informants Interviews

Key informants interview schedule guide were developed as shown in Appendix II of this report. Purposive sampling technique (Kothari, 2004) was employed in selecting key informants among them community leaders, a community based conservation leader, area chief, and representatives from KFS, KWS and NEMA for interviews. These respondents were interested in the conservation of Kingwal wetland and understand more about its benefits to the local people, and the local and the national governments, as well as the threats facing it and measures that have been taken to mitigate the threats.

3.3.3.3. Focus group discussion (FGD)

Focus group discussion (Kothari, 2004) guide was developed as shown in Appendix III of this report. Six groups of at least eight members were then organized (two groups from each part) for the FGDs.

3.4. Data Collection Methods

Data were collected using primary data collection methods.

The Primary data collection methods used were structured questionnaires (Kothari, 2004) because they can be administered by the researcher over a large area within a short time, are cost-effective since they can be self-administered, can be posted or emailed to respondents that cannot be easily reached. Furthermore questionnaires give the respondent time and space to express his/her views fully on questions asked since they consist of both open and closed-ended questions. In addition personal interviews, focus group discussions, field observations and key informant interviews were done with

members of the local administration including chiefs, village elders, county officials, and staff from NEMA, KWS, CBOs and NGOs.

Personal interviews (Kothari, 2004) were used because they allow for verification of facts and more detailed information can be obtained. Focus group discussions were used since they give a wider picture of people's knowledge and opinion concerning various issues. They also promote active and direct participation of local people in the research. Personal observations were used because first hand information is obtained and that it enables for verification of information given by the respondents.

3.5. Data Analysis and presentation

Data was analyzed using descriptive statistics, chi-square goodness of fit test, and logistic regression. A 95% confidence level of significance was used in testing results. Chi-square goodness of fit test (Zar, 1974) was used to determine which benefits were significant as well as the determinants of respondents' opinions on their level of agreement with the threats facing Kingwal wetland.

Logistic regression (Zar, 1974) was used to assess the influence of socio-economic factors on the households' willingness to pay for benefits derived from Kingwal wetland. This was applied in this study because the researcher was interested in assessing the effects of selected socio-economic factors (independent variables) on the respondents' WTP (dependent variable).

Monetary values were based on contingent valuation method (CVM) which involved asking people how much they are willing to pay for the benefits they obtain. The

information was analyzed using descriptive statistics (Zar, 1974) to obtain the range, mean, standard error and sum. The estimated economic value of Kingwal wetland was evaluated based on Barbier *et al*., (1997) framework as presented below:

The TEV of Kingwal wetland was determined based on Barbier *et al*., (1997) framework adapted from Barbier (1989a) as represented below:

TEV=UV+NUV

Whereby UV (Use values) = direct value + indirect value + option value; while

NUV (Non-use values) = existence value + bequest value

Results are presented using tables and graphs.

CHAPTER FOUR

RESULTS

4.1. Introduction

This chapter presents findings of the study guided by the objectives. It presents the socio-demographic characteristics of the respondents, benefits and costs of Kingwal wetland to the local people, threats and measures taken to mitigate threats facing Kingwal wetland.

4.2. Socio-demographic Characteristics of the Respondents

As indicated in table 4.1 out of the 240 respondents interviewed, 40% (n=96) were from middle Kingwal, 35% (n=84) from lower Kingwal and 25% (n=60) from the upper Kingwal. A high percentage of those interviewed were males (69%) as opposed to females (31%). Over 41% of the respondents were aged between 45-59 years, 31% were aged 30-44 years, 16% were 60 years and above and only 12% were 15-29 years. Slightly over twenty nine percent (29.6%) of the respondents interviewed had no education, 27.5% had attained primary education, 23.3% had tertiary education and 19.6% had secondary education.

Slightly over twenty percent (20.4%) of the respondents lived between 1.01-1.5km away from Kingwal wetland and the rest lived between the following distances: 20% lived between 0.51-1km, 20% lived between1.51-2km, 18.8% lived between 2.01-2.5km. 8.3% lived between 2.51 to 3.0km and over 3km away from the wetland and the least lived between 0-0.5km away from the wetland (4.2%) as shown in table 4.1.

Table 4.1: Socio- demographic Characteristics of Respondents

Variable	Response	Frequency	Percent (%)	Chi-square (χ^2)
Part of Kingwal wetland inhabited by Respondents	Upper Kingwal	60	25	χ^2=8.400 df=2 p=0.015
	Middle Kingwal	96	40	
	Lower Kingwal	84	35	
	Total	**240**	**100**	
Gender	Male	165	69	χ^2=33.750 df=1 P<0.001
	Female	75	31	
	Total	**240**	**100**	
Age	15-29 years	28	12	χ^2=52.233 df=3 P<0.001
	30-44 years	75	31	
	45-59 years	98	41	
	60 years and above	39	16	
	Total	**240**	**100**	
Education Level	No education	80	29.6	χ^2=11.067

	Primary level	62	27.5	df=3
	Secondary level	46	19.6	P=0.011
	Tertiary level	52	23.3	
	Total	**240**	**100**	
Distance of respondents residence from Kingwal wetland	0-0.50km	10	4.2	χ^2=49.742
	0.51-1km	48	20	df=6
	1.01-1.50km	49	20.4	P<0.001
	1.51-2.00km	48	20	
	2.01-2.5km	45	18.8	
	2.51-3.00km	20	8.3	
	Over 3 km	20	8.3	
	Total	**240**	**100**	

Results on occupation of respondents showed that 47.5% were crop farmers and 30.4% practiced livestock keeping. The rest of the responses are given in table 4.2.

Table 4.2: Occupation of the respondents

Occupation	**Frequency (F)**	**Percent (%)**	**Chi-square (χ^2)**
Crop farmer	114	47.5	χ^2=432.496, df=11, P<0.001
Livestock farmer	73	30.4	
Bricks dealer	29	12.1	
Teacher	41	17.1	
Car driver	17	7.1	
Motorbike rider	29	12.1	
Mat maker	13	5.4	
Maize roaster and seller	9	3.7	
Hair dresser	3	1.2	
Shopkeeper	8	3.3	
Agroforester	7	2.9	
Motorbike/car cleaner	2	0.8	

From table 4.3 below, 15.4% of the respondents earned income of between Ksh 80,000-100,000 per year and 13.7% earned KSh 100,001-120,000. The rest of the responses are given in table 3 below.

Table 4.3: Respondents' Level of income per year

Income level of respondents	**Frequency**	**Percent (%)**	**Chi-square (χ^2)**
Less than Ksh 20,000	10	6.2	χ^2=42.333, df=10, p<0.001
Ksh 20,001-40,000	13	6.7	
Ksh 40,001-60,000	33	13.7	
Ksh 60,001-80,000	27	11.3	
Ksh 80,001-100,000	37	15.4	
Ksh 100,001-120,000	23	13.7	
Ksh 120,001-140,000	22	9.6	
Ksh 140,001-160,000	33	9.2	
Ksh 160,001-180,000	11	5.4	

Ksh 180,001-200,000	15	4.6
Over Ksh 200,000	16	4.2
TOTAL	**240**	**100**

The average size of respondents' households was five members (Mean±S.E =5.05±0.115) with 25.8% of the households having a family size of four members and 0.8% having over ten members as shown in table 4.4.

Table 4.4: Family size of the respondent's household

Family size	**Frequency**	**Percentage (%)**	Chi-square (χ^2)
2 Members	7	2.9	χ^2=176.33, df=9, p<0.001
3 Members	39	16.3	
4 members	62	25.8	
5 Members	44	18.3	
6 Members	42	17.5	
7 Members	28	11.7	
8 Members	7	2.9	

9 Members	4	1.7
10 Members	5	2.1
Over 10 members	2	0.8
TOTAL	**240**	**100**

4.3. Benefits and Costs of Kingwal Wetland to the Local People

4.3.1. Benefits Derived by Local People from Kingwal wetland

Most of the local people (88.3%) living adjacent to Kingwal wetland derived one or more benefits from it while 11.7% did not and this varied significantly (χ^2=141.067, df=1, p<0.001). Benefits obtained by the people are shown in figure 4.1.

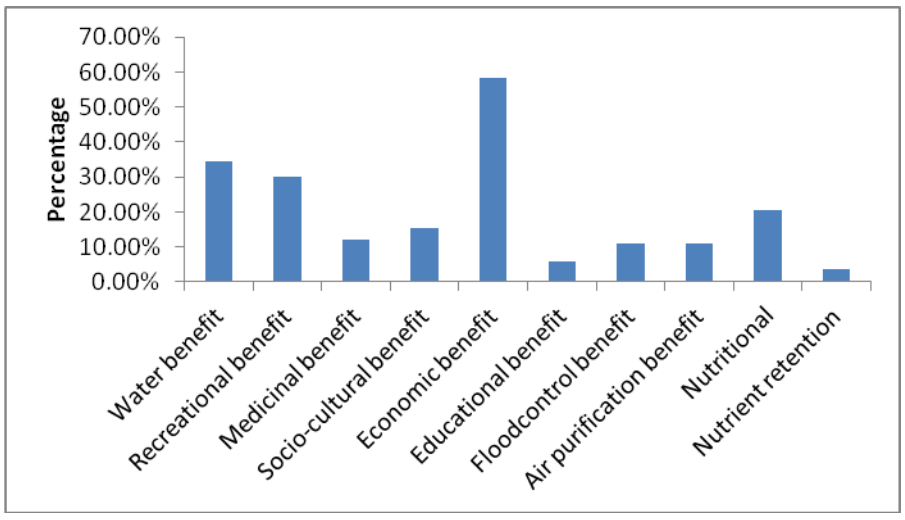


Figure 4.1: Benefits obtained by local people from Kingwal wetland

From Figure 4.1 above, the local people obtained the following three major benefits from Kingwal wetland: economic benefit (58.3%), water (34.6%) and recreational (30%). Other benefits obtained are shown in figure 4.1 above.

Economic benefits are obtained from Kingwal wetland by the local people through extracting wetland resources for sale or domestic use. The economic benefits obtained were significantly different (χ^2=187.893, df=8, p<0.001) and include usage of wetland soil for brick making (30%), thatching residential houses (21.6%) and grazing of livestock near the wetland (21.2%). Others are shown in the figure below.

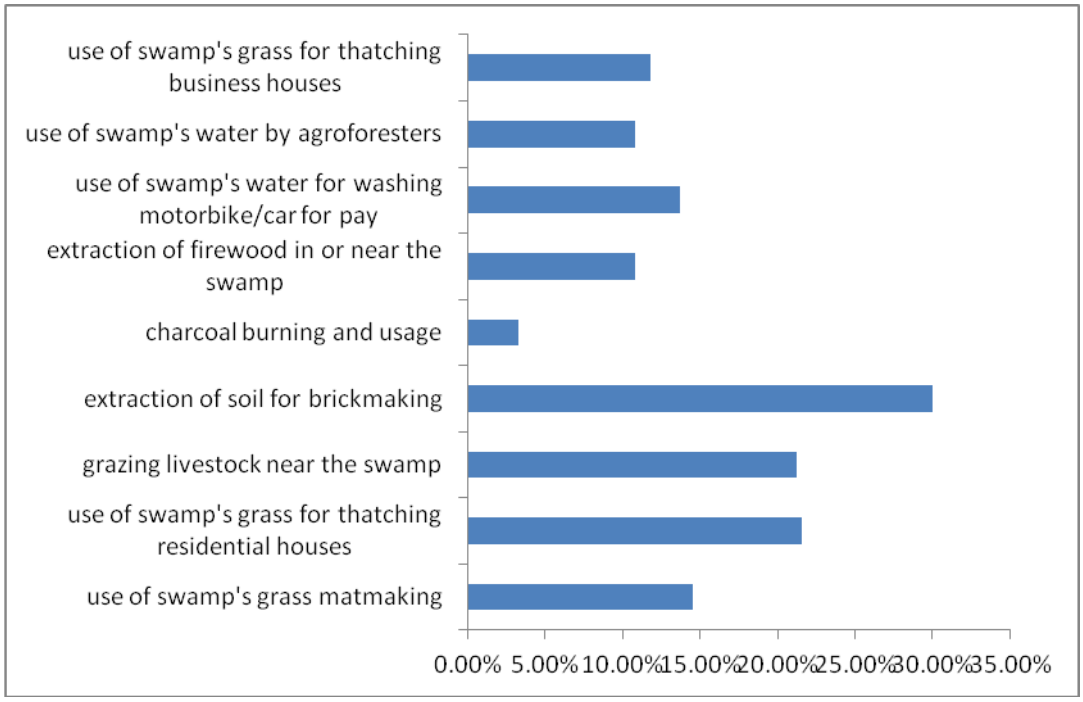


Figure 4.2: Economic benefits obtained by local people from Kingwal wetland

Water obtained by local people from the wetland and used for various activities were significantly different (water (χ^2=62.295, df=6, p<0.001) and are used for activities like

irrigation of crops in farms near the swamp (42.5%), washing clothes (35.8%), washing utensils (38.5%), bathing (36.1%), drinking by livestock (34.9%) and washing cars/motorbikes (7.2%).

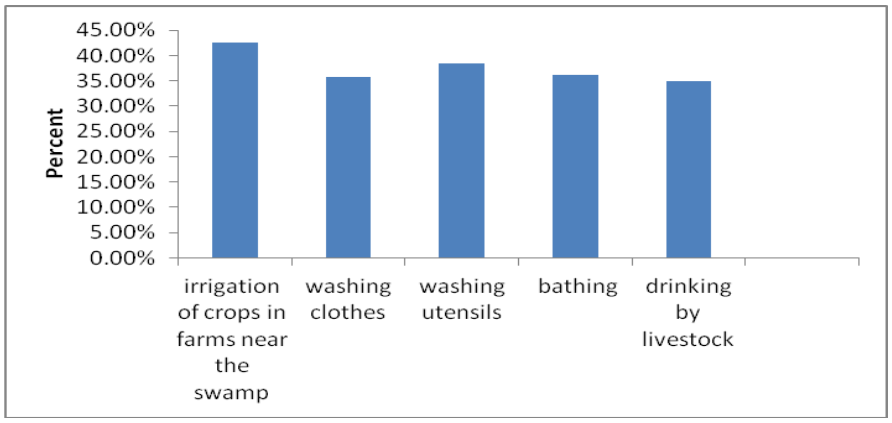


Figure 4.3: Usage of water obtained by local people from Kingwal wetland

The local people also derive socio-cultural benefits through performing circumcision/initiation rites within the wetland (15%) and holding prayers near Kingwal wetland (3.8%). Recreational benefits obtained by local people from Kingwal wetland were significantly different (χ^2=45.008, df=4, p<0.001) and include photography (32.8%), game viewing (31.4%), bird watching (7.9%) and hiking (6.3%) around and along the wetland.

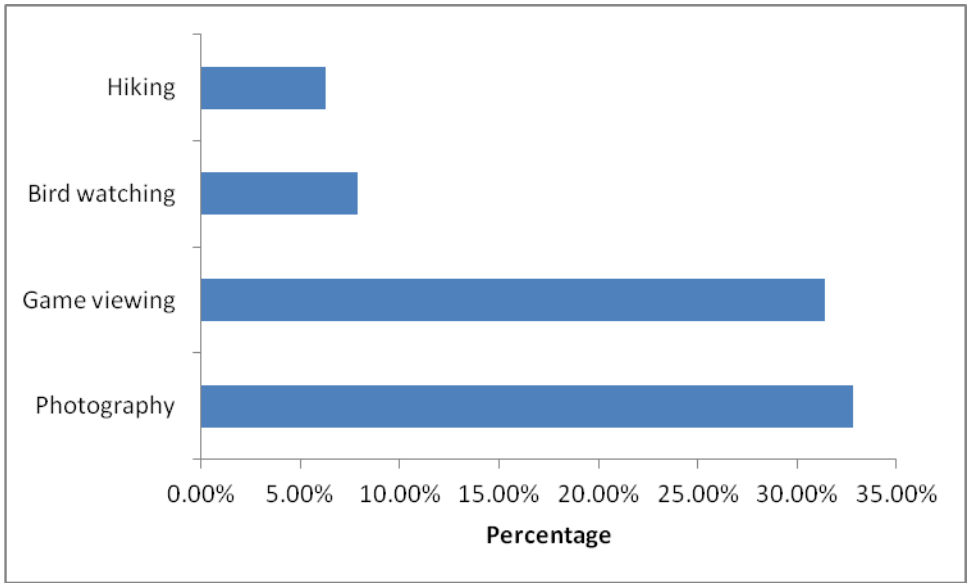


Figure 4.4: Recreation and tourism benefits obtained by local people from Kingwal wetland

Nutritional benefits that were derived from wetland resources by local people were significantly different (χ^2=16.069, df=3, p=0.001) and include harvesting products like edible wild fruits (31.3%), fish from the wetland or from those farmed using wetland water (30%), utilizing crops irrigated using wetland water (40%) and game/bird meat harvested from the wetland (1.9%) and wild traditional vegetables (1.8%) like "black night shade ('*managu*') and vine spinach *Basella alba* ('*nderema*').

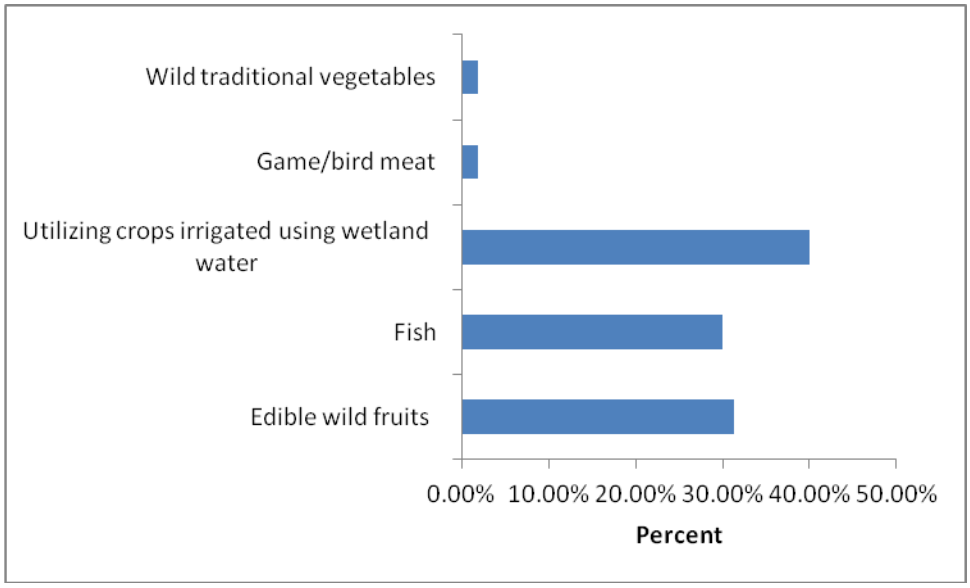


Figure 4.5: Nutritional benefits obtained by local people from Kingwal wetland

Plate, 6, 7 and 8 show some of the materials obtained from Kingwal wetland for Economic/commercial purposes.

Plate 6: Bricks made using clay and covered with grass from Kingwal wetland

(Source: Author, 2018)

Plate 7: A house roofed with grass from Kingwal wetland (Source: Author, 2018)

Plate 8: A mat made using papyrus from Kingwal wetland (Source: Author, 2018)

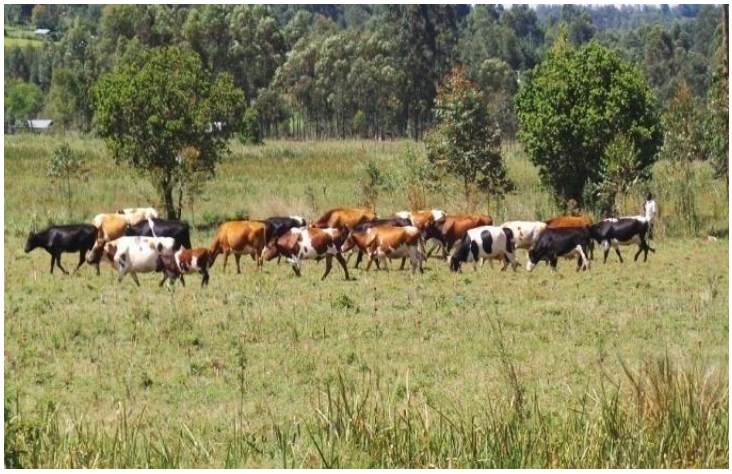


Plate 9: Cattle grazing near Kingwal wetland (Source: Author, 2018)

4.3.2. Costs Incurred by Local People from Kingwal wetland

The respondents incurred significantly different ((χ^2=141.893, df=6, p<0.001) costs from Kingwal wetland. Over forty percent of the respondents (43.7%) suggested that crop damage by wildlife was a problem arising from the presence of the wetland followed by flooding during the rainy season (32.9%) and diseases (24.2%). The rest of the responses

on costs incurred by the local people from Kingwal wetland are shown in figure 4.6 below.

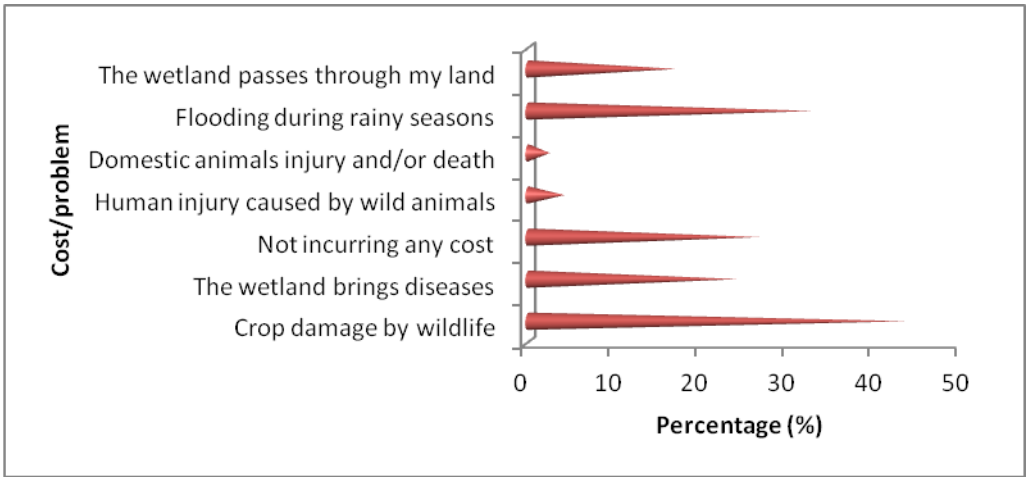


Figure 4.6: Costs incurred by the local people from Kingwal wetland

During focus group discussions and key informants interviews other costs that were reported to be brought about by the presence of the wetland include: poultry injury/death caused by mongooses, cows got stacked in the wetland mud, poor transportation/communication due to the wetland flooding during rainy seasons which prevented children from going to school, murdered people and dead domestic animals like dogs were thrown in the wetland and their decomposing carcasses polluted the water, the wetland acted as a breeding ground for vectors which cause diseases like pneumonia, typhoid and bilharzia which affect people, trypanasomiasis transmitted to livestock by wild animals found in it, and fasciolasis among livestock caused by liver flukes found in the wetland water.

4.4. Influence of Socio-economic Factors on Households Willingness To Pay

More than half of the respondents (51.2%) interviewed were willing to pay for the benefits they derived from Kingwal wetland, 37.1% (n=89) were not willing to pay any amount and 28 (11.7%) did not derive any benefit from the wetland. Most of those who were not willing to pay did not want to pay for the services since the wetland is part of their ancestral land (58%), did not know the monetary worth of the benefits (20%), the benefits did not deserve any monetary value (12%) and others didn't have money to pay for the benefits if the services and goods were to be charged (10%).

When socio-economic factors were tested using logistic regression to assess their influence on respondents WTP, results showed that part of Kingwal inhabited by respondents (B= -0.739, df=1, p=0.005); distance from the wetland (B= -0.275, df=1, p=0.028) and average income level (B= -0.643, df=1, p<0.001) of the respondent have a statistical difference with respondents willingness to pay. In contrary, it was demonstrated from the results that age, level of education, occupation, gender and family size do not have a statistical difference with the respondent's willingness to pay for the benefits derived from Kingwal wetland. Results are as shown in table 4.5

Table 4.5: Factors influencing the Household's WTP for benefits derived from Kingwal wetland

Independent variable	B	Standard error	P value
Part of Kingwal wetland inhabited by respondents	-0.739	0.263	0.005
Distance from the wetland	-0.275	0.126	0.028
Income level	-0.643	0.096	0.000

The logistic regression results also showed that the predictor variables have a correlation with the respondent's WTP (Nagelkerke r^2=0.507). Results in table 4.5 above also show that all the significant factors negatively influence household's WTP.

4.5. Kingwal Wetland's Approximated Economic Value

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). The results are as shown in table 4.6.

Table 4.6: 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
	Recreation	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
Sub-total							**292,010**
Indirect value (Ksh)	Education	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
	Subtotal						**112,561**

Option value (Ksh)	117	90,000	10,000	100,000	7,330,000	**62,649**
Bequest value (Ksh)	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**
TOTAL						**549,442**

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 willing to pay 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 willing to pay 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 willing to pay 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.

Kingwal wetland's mean annual economic value

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).

4.6. Threats Facing Kingwal Wetland

Results on respondents views on whether they agree or disagree with activities practiced within and around Kingwal wetland are threats facing Kingwal wetland are shown in table 4.7 below.

Table 4.7: Respondents' Level of Agreement on Activities Threatening Kingwal Wetland

Activity	**Strongly Agree, Frequency & Percent**	**Agree, Frequency & Percent**	**No Idea, Frequency & Percent**	**Disagree, Frequency & Percent**	**Strongly Disagree, Frequency & Percent**	**Chi-square (χ^2)**
Poaching	89 (37.1%)	84 (35%)	38 (15.8%)	22 (9.2%)	7 (2.9%)	χ^2=114.542, df=4, p<0.001
Use of chemicals on	5 (2%)	43 (18%)	72 (30%)	84 (35%)	36 (15%)	χ^2=79.375, df=4,

agricultural farms						p<0.001
Cultivating areas close to Kingwal wetland	22 (9%)	53 (22%)	98 (41%)	53 (22%)	14 (6%)	χ^2=94.833, df=4, p<0.001
Presence of eucalyptus plantation	86 (36%)	101 (42%)	19 (8%)	24 (10%)	10 (4%)	χ^2=144.292, df=4, p<0.001
Brick making	43 (18%)	130 (54%)	48 (20%)	14 (6%)	5 (2%)	χ^2=194.875, df=4, p<0.001
Harvesting of papyrus for mat making	0	28 (12%)	77 (32%)	94 (39%)	41 (17%)	χ^2=48.400, df=3, p<0.001
Clearance of wetland vegetation	125 (52%)	106 (44%)	5 (2%)	5 (2%)	0	χ^2=205.033, df=3, p<0.001

According to the results in table 4.7 above, 37.1% of the respondents strongly agreed that poaching is a threat to the conservation of Kingwal wetland while 35% agreed that poaching is a threat. The rest of the responses are shown in the table above.

Chi-square cross tabulation test results showed that the respondents' rating on their agreement on whether or not poaching is a threat to Kingwal wetland was dependent on education level (χ^2=35.733, df=12, p<0.001) and respondents' level of income (χ^2=82.475, df=40, p<0.001) as shown in table 4.8.

Table 4.8: Crosstabs of Socio-Economic Factors Influencing Respondents' Level of Agreement on Poaching as a Threat to Kingwal Wetland.

Factor (Chi-square results)		**Strongly Agree, Frequency & Percent**	**Agree, Frequency & Percent**	**No Idea, Frequency & Percent**	**Disagree, Frequency & Percent**	**Strongly Disagree, Frequency & Percent**
Education Level (χ^2=35.733, df=12, p<0.001)	No education	20 (8.3%)	25 (10.4%)	20 (8.3%)	12 (5%)	3 (1.3%)
	Primary	23 (9.6%)	23 (9.6%)	13 (5.4%)	3 (1.3%)	0
	Secondary	16 (6.7%)	16 (6.7%)	5 (2.1%)	7 (2.9%)	2 (0.8%)
	Tertiary	30 (12.5)	20 (8.3%)	1 (0.4%	0	1 (0.4%)
Average income level (χ^2=82.475,	less than 20,000Ksh	1 (0.4%)	3 (1.3%)	2 (0.8%)	4 (1.7%)	0
	20,001-40,000Ksh	1 (0.4%)	5 (2.1%)	5 (2.1%)	2 (0.8%)	0

df=40, p<0.001)	40,001-60,000Ksh	10 (4.2%)	10 (4.2%)	9 (3.75%)	4 (1.7%)	0
	60,001-80,000Ksh	8 (3.3%)	14 (5.8%)	4 (1.7%)	0	1 (0.4%)
	80,001-100,000Ksh	10 (4.2%)	16 (6.7%)	7 (2.9%)	2 (0.8%)	2 (0.8%)
	100,001-120,000Ksh	5(2.1%)	10 (4.2%)	2 (0.8%)	4(1.7%)	2 (0.8%)
	120,001-140,000Ksh	9 (3.8%)	6 (2.5%)	5 (2.1%)	1 (0.4%)	1 (0.4%)
	140,001-160,000Ksh	19 (7.9%)	9 (3.8%)	4(1.7%)	1 (0.4%)	0
	160,001-180,000Ksh	4 (1.7%)	3(1.3%)	1 (0.4%)	3(1.3%)	0
	180,001-200,000Ksh	14 (5.8%)	0	0	1 (0.4%)	0
	Over 200,000Ksh	8 (3.3%)	8(3.3%)	0	0	0

Thirty five percent (35%) of the respondents disagreed that use of chemicals on agricultural lands bordering the wetland is a threat to the conservation of Kingwal wetland while 30% had no idea. Other responses are given in table 4.7. Chi-square goodness of fit test results showed that the respondents' rating with their agreement on whether or not the use of chemicals on agricultural farms is a threat to the conservation of Kingwal wetland was dependent on occupation (χ^2=84.153, df=40, P<0.001) and size of

the household (χ^2=55.171, df=36, P=0.021) as shown table 4.9 below and level of income (χ^2=1.063, df=40, P<0.001) as elaborated after the table.

Table 4.9: Crosstabs of Socio-Economic Factors Influencing Respondents' Level of Agreement on use of Chemicals on Agricultural farms as a Threat to Kingwal Wetland.

Factors (Chi-square results)		Strongly Agree, Frequency & Percent	Agree, Frequency & Percent	No Idea, Frequency & Percent	Disagree, Frequency & Percent	Strongly Disagree, Frequency & Percent
Occupation (χ^2=84.153, df=40, P<0.001)	Crop farmer	2 (0.8%)	13 (5.4%)	21 (8.7%)	51 (21.3%)	27 (11.3%)
	Livestock keeper	1 (0.4%)	1 (0.4%)	9 (3.8%)	8 (3.3%)	3 (1.3%)
	Bricks dealer	0	0	4 (1.7%)	3 (1.2%)	0
	Teacher	2 (0.8%)	10 (4.2%)	4 (1.7%)	6 (2.5%)	2 (0.8%)
	Car driver	0	3 (1.2%)	10 (4.2%)	4 (1.7%)	0
	Motorbike rider	0	8 (3.3%)	5 (2.1%)	5 (2.1%)	0
	Matmaker	0	5 (2.1%)	5 (2.1%)	1 (0.4%)	2 (0.8%)
	Maize roaster and seller	0	1 (0.4%)	6 (2.5%)	0	0
	Hair dresser	0	0	2 (0.8%)	0	1 (0.4%)
	Shopkeeper	0	3 (1.2%)	3 (1.2%)	2 (0.8%)	0

	Agroforester	0	0	3 (1.2%)	3 (1.2%)	1 (0.4%)
	2 members	0	4 (1.7%)	3 (1.2%)	0	36 (15%)
Family size	3 members	0	5 (2.1%)	13 (5.4%)	15 (6.3%)	0
(χ^2=55.171,	4 members	1 (0.4%)	11 (4.6%)	19 (7.9%)	27 (11.3%)	0
df=36,	5 members	3 (1.3%)	13 (5.4%)	13 (5.4%)	10 (4.2%)	1 (0.4%)
P=0.021)	6 members	1 (0.4%)	4 (1.7%)	14 (5.8%)	10 (4.2%)	2 (0.8%)
	7 members	0	3(1.3%)	5 (2.1%)	14 (5.8%)	2 (0.8%)
	8 members	0	0	2(0.8%)	4 (1.7%)	1 (0.4%)
	9 members	0	1(0.4%)	1 (0.4%)	2 (0.8%)	0
	10 members	0	1 (0.4%)	2 (0.8%)	1 (0.4%)	0
	over 10 members	0	2 (0.8%)	0	0	0

In relation to the level of income, those earning Ksh.140,001-160,000 and Ksh.180,001-200,000 had the highest respondents (20%) disagreeing with the fact that use of chemicals on agricultural farms is a threat to the conservation of Kingwal wetland followed by those earning over Ksh. 200,000 (15.2%) and the rest had a percentage less than 10%.

As shown in table 4.7, more than forty percent (41%) of the respondents had no idea on whether cultivating areas near wetlands are a threat to Kingwal wetland, followed by those who agreed (22%), disagreed (22%) and the least were those who strongly disagreed (6%) with the statement. Chi-square goodness of fit test results showed that the respondents' rating on their agreement on whether or not cultivating areas near wetlands

is a threat to Kingwal wetland was dependent on gender (χ^2=12.288, df=4, P=0.015) and family size (χ^2=52.200, df=36, P=0.04).

Forty two percent of the respondents agreed that having eucalyptus plantation near the wetland is a threat while 36% strongly agreed to this. Other responses are given in table 4.7. Chi-square goodness of fit test results showed that the respondents' rating with their agreement on whether or not the presence of the eucalyptus plantation near the wetland is a threat to Kingwal wetland was dependent on part of Kingwal inhabited by respondents (χ^2=26.167, df=4, p=0.001). It was evident that location of different parts of Kingwal inhabited by respondents influence respondents' views on whether they agree or not that the presence of the eucalyptus plantation near Kingwal wetland is a threat to the wetland. Most of those who agreed live in lower Kingwal (17.1%) followed by those from middle Kingwal (15%) and the least were from upper Kingwal (9.6%).

Table 4.10: Crosstabs of Socio-economic Factors Influencing Respondents' Level of Agreement on the Presence of the Eucalyptus Plantation near the Wetland as a Threat to Kingwal Wetland.

Factor (Chi-square results)		**Strongly Agree, Frequency & Percent**	**Agree, Frequency & Percent**	**No Idea, Frequency & Percent**	**Disagree, Frequency & Percent**	**Strongly Disagree, Frequency & Percent**
Part of Kingwal inhabited by respondents	Upper Kingwal	32 (13.3%)	23 (9.6%)	6 (2.5%)	4 (1.7%)	1 (0.4%)
	Middle Kingwal	24 (10%)	36 (15%)	13 (5.4%)	15 (6.3%)	8 (3.3%)
	Lower kingwal	30 (12.5%)	41 (17.1%)	1 (0.4%)	4 (1.7%)	2 (0.8%)
	Total	86	100	20	23	11

More than half of the respondents (54%) agreed that brick making is a threat to the conservation of Kingwal wetland, 20% had no idea, 18% strongly agreed and other responses are as shown in table 4.7. Chi-square crosstabs test results illustrated that respondents' opinions on whether they agree or not that brick making is a threat to Kingwal wetland was dependent of part of Kingwal inhabited by respondent (χ^2=42.600, df=4, P<0.001), education level (χ^2=34.769, df=12, P<0.001) as illustrated in table 4.11 below; occupation (χ^2=92.184, df=40, P<0.001) and level of income (χ^2=1.044, df=40, P<0.001).

Table 4.11: Crosstabs of Socio-Economic Factors Influencing Respondents' Level of Agreement on Brick Making as a Threat to Kingwal Wetland.

Factor (Chi-square results)		Strongly Agree, Frequency & Percent	Agree, Frequency & Percent	No Idea, Frequency & Percent	Disagree, Frequency & Percent	Strongly Disagree, Frequency & Percent
Part of Kingwal inhabited by respondent	Upper Kingwal	13 (5.4%)	35 (14.6%)	14 (5.8%)	4 (1.7%)	3 (1.2%)
	Middle Kingwal	9 (3.8%)	43 (17.9%)	31 (12.9%)	11 (4.6%)	2 (0.8%)
	Lower kingwal	22 (9.2%)	50 (20.8%)	3 (1.3%)	0	0
Education level of respondent	No education	7 (2.9%)	42 (17.5%)	22 (9.2%)	7 (2.9%)	2 (0.8%)
	Primary education	11 (4.6%)	36 (15%)	12 (5%)	3 (1.3%)	0
	Secondary education	13 (5.4%)	22 (9.2%)	7 (2.9%)	2 (0.8%)	2 (0.8%
	Tertiary education	13 (5.4%)	28 (11.6%)	7(2.9%)	3 (1.3%)	1 (0.4%)

The highest number of those who agreed that brick making is a threat came from lower Kingwal (20.8%) followed by those from middle Kingwal (17.9%) and lastly upper Kingwal (14.6%). With regard to the education level of respondents influencing rating on

whether brick making is a threat to the conservation of Kingwal wetland, most of those who agreed had no education (17.5%) followed by those with primary education (15%).

In terms of occupation 28.7% of the crop farmers, followed by teachers (5.8%) agreed with the fact that brick making is a threat to the conservation of Kingwal wetland. The rest of the respondents had a percentage of those agreeing below 5%. In terms of level of income, 8.3% of those earning Ksh. 140,000 to 160,000 agreed that brick making is a threat followed by those earning Ksh. 160,000-200,000 (7.5%), those earning Ksh. 80,000-100,000 (6.7%) and those earning Ksh. 100,000-140,000. Out of the 4.7% who reported earning the least income (Ksh. 40,000 and below) only 1.3% of respondents earning Ksh. 20,000-40,000 and 1.3% of those earning below Ksh. 20,000 (1.3%) agreed that their low income level influenced conservation of Kingwal wetland.

Thirty nine percent of the respondents disagreed that mat making is a threat to the conservation of Kingwal wetland, 32% had no idea, 17% strongly disagreed and 12% agreed as demonstrated in table 4.7. Chi-square goodness of fit test results showed that respondents' opinions on whether they agree or not that mat making is a threat to Kingwal wetland was dependent on gender (χ^2=13.932, df=3, P<0.001). On the issue of gender, more males (31.3%) disagreed as compared to the females (7.9%).

Table 4.12. Crosstabs of Socio-Economic Factors Influencing Respondents' Level of Agreement on Mat making as a Threat to Kingwal wetland.

Factor (Chi-square results)		Strongly Agree, Frequency & Percent	Agree, Frequency & Percent	No Idea, Frequency & Percent	Disagree, Frequency & Percent	Strongly Disagree, Frequency & Percent
Gender of the respondents (χ^2=13.932, df=3, P<0.001)	male	0	21 (8.7%)	42 (17.5%)	75 (31.3%)	27 (11.3%)
	Female	0	7 (2.9%)	36 (15%)	19 (7.9%)	13 (5.4%)
	Total		28 (11.6%)	78 (32.5%)	94 (39.2%)	50 (16.7%)

Fifty two percent of the respondents strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland, 44% agreed, 2% disagreed and 2% had no idea as illustrated in table 4.7. Chi-square goodness of fit test results revealed that respondents' opinions on whether they agree or not that clearance of wetland vegetation is a threat to Kingwal wetland was dependent of gender (χ^2=11.110, df=3, P=0.011), education level (χ^2=34.176, df=9, P<0.001) and level of income (χ^2=1.182, df=30, P<0.001).

Table 4.13. Crosstabs of Socio-Economic Factors Influencing Respondents' Level of Agreement on Clearance of Wetland Vegetation as a Threat to Kingwal wetland.

Factor (Chi-square results)		Strongly Agree, Frequency & Percent	Agree, Frequency & Percent	No Idea, Frequency & Percent	Disagree, Frequency & Percent
Gender of the respondents	Male	78 (32.5%)	81 (33.7%)	4 (1.7%)	2 (0.8%)
	Female	47 (19.6%)	24 (10%)	0	4 (1.7%)
Education level of the respondents	No education	33(13.7%)	21 (8.7%)	3 (1.3%)	4 (1.7%)
	Primary education	35 (14.6%)	26 (10.8%)	0	1 (0.4%)
	Secondary education	26 (10.8%)	18 (7.5%)	1 (0.4%)	1 (0.4%)
	Tertiary education	31 (12.9%)	40(16.7%)	0	0

In relation to the level of income, 8.8% of those who strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland had an average annual income of Ksh. 140,001-160,000, 6.3% earned over Ksh.200,000, 5.8% earned Ksh.80,001-100,000 and 1.7% earned below Ksh.40,000.

4.7. Measures taken to mitigate threats facing Kingwal wetland

When respondents were asked what should be done to improve conservation of Kingwal wetland, 48% suggested that Kingwal wetland should be fenced to control the movement of wild animals in and out of the wetland, 37% stated compensation of those facing human-wildlife conflicts and 30% proposed formation of community based conservation groups, The rest of their responses are shown in figure 4.3.

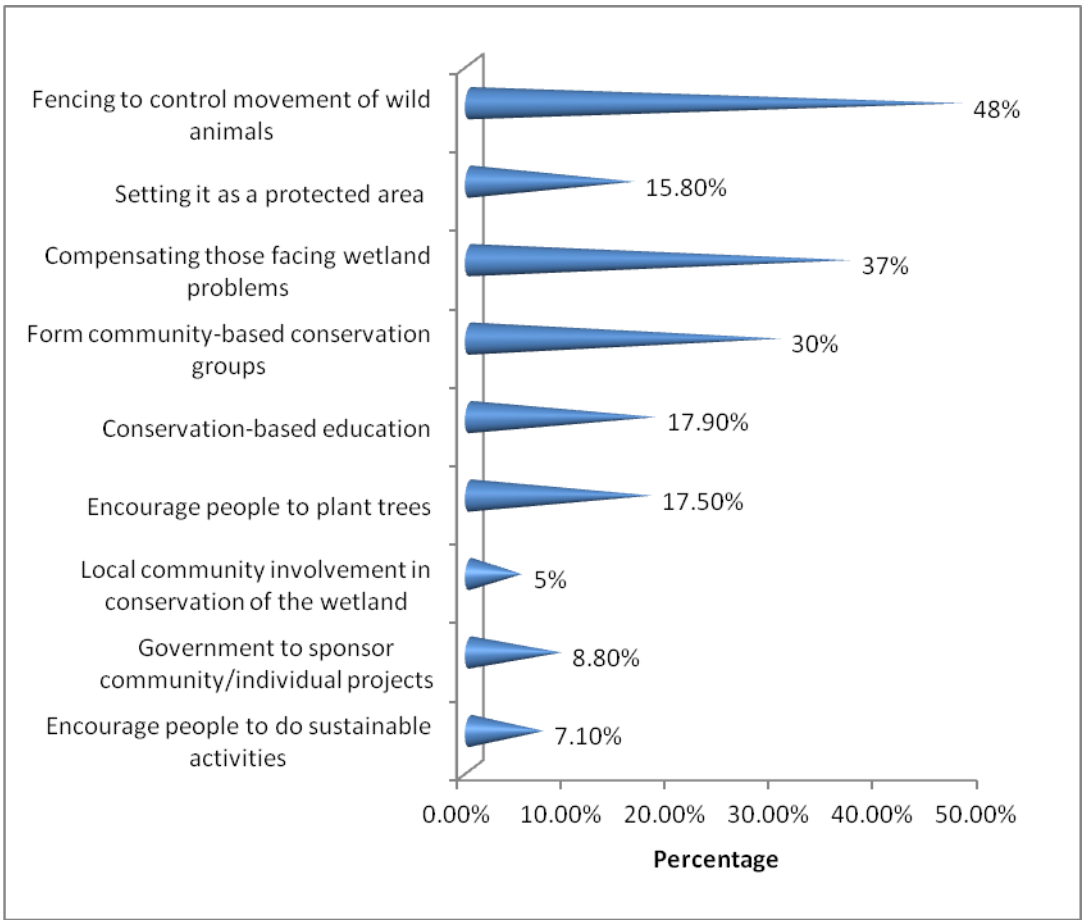


Figure 4.7: Measures taken to mitigate threats facing Kingwal wetland

Chi-square goodness of fit test results on the measures suggested by respondents to mitigate threats facing the wetland demonstrated that the measures were significantly different (χ^2=212.502, df=10, p<0.001).

4.7.1. Membership to conservation groups

Lastly, when respondents were asked if they are members of any conservation groups, 4.6% reported being members of a conservation group while 95.4% were not members of any conservation group (χ^2=81.667, df=1, p<0.001). Reasons given for not being members of any conservation group were as shown in the table 4.9 below. Conservation groups found around Kingwal wetland include Kingwal Swamp Conservancy Trust Fund (2.9%) and Kingwal Wildlife and Environmental organization (1.2%).

Table 4.14. Reasons given by the respondents for their lack of membership in conservation groups

Reason Given	Percentage
I had not heard of any conservation group form around my residential area	43.5%
I am not ready to be a member of any conservation group	33.7%
no reason was given	22.8%

Other conservation groups reported during focus group discussions are: Center of Community Dialogue and Development and Kimibik organization.

CHAPTER FIVE

DISCUSSION

5.1. Socio-demographic characteristics and their implications on Kingwal wetland

From the results, a higher number of respondents were selected from middle Kingwal (40%) because the area is densely populated compared to upper and lower Kingwal. This is because the tarmac road which is the main road passes through middle Kingwal. Chepterit centre is also located here and most people living here are on temporary basis and are in search of places to do self employed jobs like shop keeping, hairdressing, and provision of hotel and restaurant services among others. Likewise, most of the people have settled here so that they can easily access most resources they need especially residential and/or business rooms, food and transport. Similarly, the high soil fertility of land in lower Kingwal coupled with high rainfall almost throughout the year makes the area fit for the growing of many different crops making it the next densely populated part of the wetland. Due to more people living in middle Kingwal they had more impact on the wetland than the rest thus leading to environmental pollution.

Most respondents interviewed were males (69%) since majority of the households in the study area are headed by males and then are in line with traditional African customs. Further, since the researcher aimed at interviewing household heads, this explains why the study sample was skewed towards the males. The few females interviewed were either single parents and therefore were heads of their households or represented males who were not available during the interviews. The absence of males in some households during the study period did not however, deter women from participating in making key

decisions on the use and conservation of Kingwal wetland and its resources. These findings agree with the findings of Babatunde *et al*. (2012) in their research on willingness to pay for community health insurance and its determinants among household heads in rural communities in North-Central Nigeria. Likewise, similar findings were reported by Turyahabe *et al*. (2013) in their research on contribution of wetland resources to household food security in Uganda.

A large number of respondents were aged between 30-59 years (72%) and this may be attributed to various reasons. First, most of the interviewees alluded that residents in the study area start families after 29 years. Likewise, due to high rates of unemployment most of the youths reside in the area eking a living from doing jobs like farming, charcoal burning, and brick and mat making among others. Since these activities are done around and within Kingwal wetland, they have had varied impacts on the wetland and its resources. These findings tally with those of Garenne (2004) who reported that for people born after 1975 in Namibia, Botswana and South Africa, marriage start after 20 years especially in urban areas.

Most of the respondents who were interviewed had either no education (29.6%) or low education (27.5%). This may be attributed to the fact that most of the people especially from lower and middle Kingwal invest more in farming since the area is ideal for farming and hence do not value education. In addition, availability of simple jobs like motorbike cleaning and tea picking has forced most of the pupils to drop out of primary schools and venture into these activities since they are easily available and generate instant and easy income unlike education which takes a long time for its benefits to be realized, besides being difficult. Another factor which may have contributed to low education level is that

some females may have dropped out of school due to teenage pregnancy. This shows that the level of illiteracy among the adults is high. The low levels of education may explain why most local residents are a threat to the wetland through engaging in unsustainable activities like draining the wetland to create farmland, harvesting of reeds to make mats and unregulated grazing among others. These findings corroborate with those of Babatunde *et al*. (2012) who reported almost half of the respondents they interviewed had no formal education.

A high number of the respondents interviewed lived between 0.5-2.5 km from the wetland (60.4%) since the area less than 500 meters from the wetland floods during the rainy season and is therefore not fit for settlement. Consequently, people living between 0.5-2.5 km not only access more of the wetland benefits, but also incur more losses from the presence of the wetland. They are therefore the ones threatening the wetland more than those living beyond 2.5km.

Most of the respondents interviewed were crop farmers (47.9%). The area around Kingwal wetland has fertile soils that require little fertilizers. These soils support crops like maize and beans. Likewise, since most of the people had little or no education, it is difficult for them to seek alternative employment. Most end up investing in farming in order to meet their subsistence needs since the farming activities undertaken do not require specialized skills. Thus, besides the favourable conditions prevailing in the area, people use their traditional knowledge to enhance farming. Despite this, respondents reported that although most of those who resided close to Kingwal wetland derived benefits from it, they also incurred costs due to the presence of the wetland and the wildlife it harbours and this threatens the people as well as the crops and cause livestock

attacks. These findings tally with those of Nabahungu and Visser (2011) who reported that Cyabayanga and Rugeramigozi wetlands in Rwanda support crop farming more than any other activity especially during dry seasons.

5.2. Benefits and Costs of Kingwal Wetland to the Local People

5.2.1. Benefits derived by local people from Kingwal wetland

Wetlands provide benefits to local people living adjacent to them. Study results expressed that various benefits derived from Kingwal wetland include economic, water, recreational, socio-cultural, nutritional, medicinal, education and research, flood control and air purification. Similar benefits were reported by Kakuru *et al*. (2013) from eight wetlands in Uganda.

A high number (58.3%) of local people derived economic benefits from Kingwal wetland. Likewise, interviews with key informants (Figure a) and focus group discussions (Figure g) showed that the local people derived more economic benefits as compared to other benefits. This is because the wetland has natural resources which are harvested and sold directly or scan be used as raw materials to make products like mats and/or can be used directly or indirectly to support many economic activities. Raw materials extracted from the wetland include papyrus for mat making, grass for livestock and roofing houses, clay for brick making, trees provide wood for construction, charcoal burning and firewood among others. These resources support respondents' livelihoods. Extraction of resources for economic purposes has also been reported by Oduor *et al*. (2015) in Nyando wetland. The extraction of economic benefits like timber, firewood, honey and other wetlands resources serve as raw materials for industries has also been

reported by Kakuru *et al*. (2013), Kamukasa and Adonia (2013), Salem and Mercer (2012) and Agatha and Romulus (2014).

The second major benefit derived from Kingwal wetland is water 34.6%). This is a basic need that is required to meet the daily needs of households adjacent to the wetland. Those living close to the wetland for example use the water for bathing, cleaning clothes and utensils, drinking by people and livestock and for motorbike/car washing and swimming. The water from the wetland is also used for irrigation especially during dry seasons. Agatha and Romulus (2014) reported similar findings from Yala swamp where water extracted from the wetland was used mainly for domestic purposes while Oduor *et al*. (2015) reported the water fetched was used for crop irrigation and domestic purposes by local people in Nyando wetland.

Another major benefit derived from Kingwal wetland are recreation and tourism. Respondents contended that they derived recreational and tourism benefits from the wetland because it contains wild plants and animals as well as water. Wild plants especially papyruses grow very close and form a beautiful scenery for photography. Wild animals particularly the Sitatunga antelope and water birds are ideal for game viewing and bird watching. The wetland water provides water for swimming and other water activities. Kakuru *et al*. (2013) and Oduor *et al*. (2015) reported similar findings from eight Ugandan wetlands and Nyando wetlands in Kenya, respectively. Likewise, Salem and Mercer (2012) and Momanyi and Ariya (2015) also reported that wetlands provide recreational and tourism benefits. Hence there is need to sustainably utilize wetlands to enhance their posterity.

Other benefits derived by the local people from the wetlands include nutritional, socio-cultural, medicinal, control of floods, purification of air and nutrient retention benefits. Regarding nutritional benefits, the wetland supports crop farming through provision of irrigation water and fertile land, provides traditional vegetables like black night shade (*managu*) and edible fruits like water berry, supports fish and other edible wild game thus contributing to household food security. These findings agree with those of Agatha and Romulus (2014) about Yala swamp where the local people derived nutritional benefits in the form of fish, crops, and traditional vegetables among others. The respondents accrue socio-cultural benefits from the wetland among such as circumcision rites and spiritual prayers. These findings corroborate with those of Terer *et al*., (2004) cited in Momanyi and Ariya (2015). The wetland also provides medicinal benefits to local people from indigenous shrubs and trees whereby their leaves, roots and barks are used to treat a wide range of diseases. These results tally with those of Marti (2011), Panda and Misra (2011), Salem and Mercer (2012) and Sarmah *et al*. (2013).

Respondents stated that Kingwal wetland helps in mitigating floods. Flood control by the wetland minimizes damage on property and farmlands. Griffin (2012), Marti (2011), Kakuru *et al*. (2013), Kipkemboi *et al*. (2007) and Salem and Mercer (2012) reported that wetlands shelter local people living adjacent to them from floods and therefore protect them and their properties from damages.

5.2.2. Costs Incurred by Local People from Kingwal Wetland

The local community living around Kingwal wetland incur direct and indirect costs as a result of the swamp. Most of the respondents (43.7%) complained of crop damage by

wild animals especially Sitatunga, a fact that was raised during interviews with key informants as illustrated in figure b on Appendix V and focus group discussions as illustrated on figure h on Appendix VII. This finding agrees with the findings of Hartter (2009) who reported that local people living around forest fragments and wetlands of Kibale National Park in Uganda experience crop damage by vervet and redtail monkeys. Likewise, Karanth *et al*. (2013) reported similar results from local people living around three Indian protected areas and alluded that crop damage is the main problem faced by local people. This problem around Kingwal swamp can be attributed to crop farming which happens throughout the year as their main source of livelihood. Also due to the fact that the wetland is not fenced and therefore, the Sitatungas freely move in and out of the wetland to the farms cause crop destruction. During focus group discussions it was reported that the crops fed on by the Sitatunga include collard greens (*sukuma wiki*), young cabbages and maize, and this reduces their yields yet these crops constitute respondents' main source of livelihood. Respondents further reported that more often they are tempted to kill the animals in relation for the losing of farm products since there is no compensation by the government for the losses.

About thirty three percent (32.9%) of the respondents complained of flooding during rainy season while interviews with the local authorities from the middle Kingwal reported that many a times they are forced to relocate the affected people to safer places which create a problem to local authorities of resettling the affected people. Flooding is aggravated by the threats from human activities like cultivation into the wetland pheriphery, extraction of soil for brick making which loosens the wetland soil and makes it weak to store flood water and allow it to percolate. As a consequence, excess water

often floods the entire area thus affecting people's settlements and other activities. Dawson *et al*. (2009) reported similar findings in coastal wetlands and attributed this to change in climatic factors like rainfall and temperatures.

More than twenty percent of the respondents reported that the wetland brings about diseases especially malaria since wetland retains water providing a suitable breeding ground for mosquitoes. Other diseases associated with the wetland that were reported during focus group discussions include pneumonia and typhoid in human beings and facioliasis and trypanosomiasis in livestock. Typhoid was attributed to the heavy contamination/pollution of wetland water by chemicals from agricultural farms and human and animal waste disposal. Pneumonia is attributed to the extreme cold conditions of the wetland environment due to the presence of water especially during rainy seasons as reported by respondents from lower Kingwal during the focus group discussion. These findings corroborate with those reported by Malan (2009) who stated that malaria disease is common in areas where there are wetlands in South Africa. According to Hughes and Hughes [(1992 cited in MEMR, 2012)] who did studies in Lorian swamp established that the swamp provides a habitat for mosquitoes that spread malaria and snails that cause bilharzia disease.

Lastly, 4.2% of the respondents alluded to human injury as a problem caused by snakes while 2.5% of the respondents reported their livestock/domestic animals have been injured by snakes that inhabit bushy parts of the wetland. Cases of livestock and human injury by wild animals have been reported by Karanth *et al*. (2013) around India's protected area.

5.3. Influence of Socio-economic factors on the households' Willingness to pay (WTP)

Parts of Kingwal wetland inhabited by respondents influence respondent's decision on whether to pay or not to pay for the benefits derived from Kingwal wetland. A higher percentage (39.3%) of people who are WTP for the benefits they derived from the wetland are from the upper Kingwal followed by those from middle Kingwal (33.6%) while the least were from lower Kingwal (27.1%). This may be attributed to the fact that upper Kingwal receives little rainfall and has a longer dry season annually compared to the middle and lower Kingwal (Lesiyampe *et al*, 2018) and therefore the wetland provides the residents with water for livestock, irrigation and for domestic purposes during dry seasons. In their research undertaken in Shadegan international wetland in Iran, Kaffashi *et al.* (2011) found similar findings and noted that a respondent's residential area influences the willingness to pay.

Distance from the wetland also has a significant impact on the respondent's WTP. The negative coefficient (B= -0.275) signifies a negative influence meaning that the nearer a person lives next to the wetland, the more WTP due to the benefits derived from it and vice versa. This may be because people living closer to the resource access more of its values/services and goods more easily than those living far away from the resource. This contradicts with the findings of Wassawa (2017) who reported a positive significant impact of distance on the respondents' WTP. This contrast may be because most respondents who live closer to Kingwal wetland access and depend more on the wetland resources for their daily livelihoods and therefore gain more from it than those living far away from the wetland. Respondents living close to a public water source were WTP less

for improved water source because they were gaining water alone and since they were near the source, and wanted to minimize the costs. Therefore the respondents of this study are WTP according to the economic value they are deriving from the wetland.

Respondents' income had a negative significant impact on their WTP for benefits derived from Kingwal wetland. However, this contradicts with the findings of Wassawa (2017) who reported a positive influence of income on the respondents' WTP and this may be attributed to the fact that he was investigating WTP for improved water source in Nebelet town where all its residents had serious water shortages since it is a town and most of the people are employed. Likewise, the fact that water is an essential need in every person's daily life whether rich or poor may explain why people were positive and WTP based on their income. Despite this, this research focused on WTP for services and goods not necessarily obtained by everybody but mostly by those who are poor, having little income and are using the wetland's resources to supplement their daily needs. People earning less income may be self-employed hence depend on economic activities supported by the wetland to sustain their daily livelihoods or if they are employed, their income is so low that they need to do alternative activities most of which depend on the wetland for example livestock keeping, and therefore are more WTP for the services and goods.

5.4. Approximate economic value of Kingwal Wetland

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. According to Oduor *et al.* (2015), Nyando wetland which is 3,600km^2 had an estimated economic value of Ksh. 143.4 billion (USD. 1.5 billion) or Ksh. 6 million/ha per year. This is explained by the higher value of

resources like crops and their products, fodder, fish and water which is in high demand, and the fact that the researchers used market prices of the resources derived from Nyando wetland as compared to the current study where the researcher used only the CVM which involves the respondent's WTP based on approximation.

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). 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.

5.5. Threats facing Kingwal wetland

In line with what is documented in literature that most of the threats facing wetlands are human induced, results from study revealed that many respondents openly declared that they are the ones threatening Kingwal wetland and this means that they are willing to support its conservation if they are sensitized on how they should participate in its conserving. This is evidenced by most respondents strongly agreed that poaching of wild animals is a threat; that eucalyptus plantation around the wetland is a threat, most agreed that brick making is a threat and a significant number strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland. Despite this, the need for more food by the rising human population adjacent to the wetland coupled with the fact that most of the respondents depend on crop farming as a source of livelihood threatens the conservation of the wetland. Consequently, majority of the respondents disagreed that use

of chemicals on agricultural lands is a threat to the conservation of the wetland. However according to different authors among them Daryadel *et al*., (2014) and Ahidur (2016) chemicals used in agricultural farms like pesticides and herbicides threaten aquatic lives.

Most respondents agreed (37.1%) that poaching of wild animals partivurlarly Sitatunga is a threat to the conservation of Kingwal wetland and this agrees with the findings of Okello and Kiringe (2004) who reported that a number of Marine protected areas in Kenya are facing poaching of wild animals. Likewise, Amin *et al*. (2006) reported similar results about rhinoceros species and stated that they are facing serious threat from poachers in demand for their horns. Respondents in the current study were aware that poaching reduces the number of wild animals in Kingwal a fact that was agreed on during focus group discussions with members of lower Kingwal who reported that unlike in the past when the Sitatungas were more, they have become few due to poaching and other factors. Despite this, the heavy fine imposed on whoever is found poaching wild animals as reported by KWS may have also contributed to their view that poaching is a threat because they fear being fined. The education level of respondents had an influence on their opinions on whether they agree or not that poaching is a threat since most of those with higher education level agreed and/or strongly agreed with the statement because their high level of education had given them wide exposure and empowered them on why and how important wildlife resources are, and how poaching had reduced their number towards extinction. Income level also influenced the respondents' response on whether they agreed or not that poaching is a threat in that those earning a higher income per month strongly agreed that poaching is a threat and this may be because these can afford

to buy meat and therefore do not depend on wild animals for meat since the main reason for poaching for game meat for human subsistence consumption.

Thirty five percent of the respondents disagreed that use of chemicals on agricultural farms is a threat to the conservation of Kingwal wetland and this contradicts with the findings of Agatha and Romulus (2014) who found that most of the local people living close to Yala swamp reported that use of chemicals on agricultural farms was a threat to the swamp. This contradiction may be due to the fact that the local people surrounding Yala swamp as reported by Agatha and Romulus are not the ones farming close to it because their lands were taken by an investor (Dominion farm) with little compensation in exchange hence they are bitter since they are not benefitting. They also had better education because they contended that chemicals used in Dominion farm especially pesticides and herbicides are toxic to fish and livestock and have contributed to the disappearance of indigenous vegetables. On the other hand, local people surrounding Kingwal wetland are the ones still living around the wetland and most of them practice crop farming adjacent to the wetland as their main source of livelihood. Since chemicals used on farms to support their crops, they do not agree that they are a threat to Kingwal wetland. Likewise most of the respondents in the current study had low or no education and therefore may be ignorant of the negative effects chemicals have on wetland biodiversity.

Opinions of local people living close to Kingwal wetland were influenced by occupation in that most crop farmers (21.3%) disagreed that the use of chemicals in agricultural farms is a threat to Kingwal wetland and this is due to the fact that chemicals increase the yields on their farms by making them resistant to diseases and pests. Therefore they may

not have wanted to admit that chemicals are a threat to Kingwal wetland conservation for fear that it may lead to their being banned which would affect their farming. In relation to income, those earning an average amount of income disagreed that chemical usage in farms is a threat and this is attributed to the fact that most of them are crop farmers and have obtained higher yield and income through use of chemicals on farms, and therefore fear that their income will reduce if chemicals is declared a threat and banned. In line with family size, those who had a big family size disagreed that chemical usage in farms is a threat and this may be attributed to the fact that bigger families required a higher amount of food to consume than small families and the use of chemicals on crop farms increases yields which in turn results in more food thus ensuring that family needs are catered for.

From the results, 41% of the respondents had no idea on whether cultivation of areas close to the wetland was a threat to the wetland or not. This may be attributed to high human population growth in the study area creating a greater demand for more food and other needs, and has in turn increased demand for more land for crop farming. As a consequence, there is encroachment on land close to the wetland which is viewed as ideal for farming especially during dry seasons. Hence respondents were confused on whether to agree, strongly agree, disagree or strongly disagree with the statement. This study results contradict those of Wright and Wimberly (2013) because their results were based on observation of the study area from the year 2006 to 2011 without interrogating local people. In this study, the findings are based on local people's opinions that may have been driven by their needs. From focus group discussions and field observation, it was

evident that continued encroachment on Kingwal wetland has led to negative impacts from human activities.

More than three quarter of the respondents (78%) agreed and strongly agreed that the eucalyptus plantation near Kingwal wetland is a threat to its conservation and were therefore in support of the preservation of the wetland's natural appearance. Planting eucalyptus has threatened the wetland by absorbing a lot of water thus contributing to the wetland drying up and this has affected wetland vegetation and wild animals found in it. These findings corroborate with those of Namulema (2015) who reported that planting of eucalyptus around Kiyanja-Kaku wetland has led to its degradation. They also agree with what Bezabih and Mosissa (2017) reported that eucalyptus planted close to wetlands is a threat since a lot of water is used thus drying up wetlands. The respondents' opinions were dependent on part of Kingwal inhabited by the respondents and level of income. With regard to the part of Kingwal inhabited by respondents, most respondents from lower and middle Kingwal agreed that the eucalyptus plantation near Kingwal wetland is a threat to its conservation and this may be attributed to the fact that the weather in these two parts of the wetland as well as the soil is good for crop farming almost throughout the year. Further, eucalyptus prevents their crops from accessing sunlight to enhance photosynthesis and/or the trees used a lot of water reducing water for farming during the dry season. Likewise, lower and middle Kingwal areas are densely populated compared to upper Kingwal and since they are very good for crop farming, there is a lot of pressure by people for more farming land and hence do not support planting eucalyptus. A few respondents from the upper Kingwal agreed that the presence of eucalyptus plantation near Kingwal wetland is a threat to its conservation since farming is not done throughout

the year as the area receives little rainfall all year round compared to the middle and lower Kingwal (Lesiyampe *et al,* 2018). This may have made most of the respondents view eucalyptus as one of the alternative sources of income especially during dry seasons.

More than half of the respondents (54%) agreed that brick making is a threat to the conservation of Kingwal wetland. This view was supported during focus group discussions with members from lower Kingwal reporting that extraction of soil for brick making leads to diversion of water away from the wetland which slowly makes it to dry and the diversion also leads to flooding during rainy seasons in areas downstream from the wetland. Respondents further stated that brick making has polluted wetland water and affected aquatic organisms. These findings corroborate with those of Khan and Vyas (2008) who reported that the Indian brick industry has led to water pollution in Kshipra river, as well as those of Wasswa (2013).

Chi-square goodness of fit test results disclosed that respondents' views on the impact of brick making on Kingwal wetland were influenced by education level, occupation and level of income. In relation to part of Kingwal inhabited by respondents, most of those who agreed that brick making is a threat came from lower Kingwal followed by those from middle Kingwal and the least came from the upper Kingwal. This may be attributed to the terrain in the three parts of the wetland whereby lower Kingwal is generally low in altitude although some parts are steep such that extracting soil from these parts makes them susceptible to flooding and dangerous to people than upper Kingwal whose terrain is slightly higher and fairly flat.

With regard to the education level, most of those who agreed that brick making is a threat to the conservation of Kingwal wetland had the highest education and this may be attributed to the fact that they had knowledge on the fact that the extraction of soil for brick making diverts water away from the wetland making the wetland to dry up, and also creates depressions where water collects leading to flooding and are breeding grounds for mosquitoes that transmit malaria. Occupation also influenced the respondents' opinions on whether brick making is a threat to the conservation of Kingwal wetland in that most crop farmers and those combining crop farming and other economic activities agreed that brick making is a threat and this may be attributed to the fact that after soil has been extracted for brick making, the fertile soils which support crops and wetland vegetation is removed leading to poor growth and destruction of vegetation. Similarly, once soil is extracted, the area is subjected to high risk of flooding and hence does not support crops like maize. In relation to level of income, most of those earning Ksh. 140,000/00 to 160,000 per annum agreed that brick making is a threat to the conservation of Kingwal wetland compared to those earning very low income (below Ksh. 20,000). This is because those earning low income looked at brick making as an alternative source of income to supplement their needs as compared to those earning high income per year who are able to satisfy their needs with their income and therefore may not look at brick making and other simple economic activities as sources of income.

Approximately forty percent of respondents disagreed that mat making is a threat to Kingwal wetland and their responses were influenced by gender and education level of the respondents. In relation to education level, most of those who had attained tertiary level of education disagreed that mat making is a threat to the conservation of Kingwal

wetland and this may be attributed to the fact that they are aware that when papyrus are cut, most of them re-grow and this promotes their multiplication as reported during focus group discussions. This finding contradicts with those of Bezabih and Mosissa (2017) who said that mat making is a threat and this may be because they were giving their own views and not the users' views unlike in the current study whose results were based on users' opinions. Respondents disagreed that mat making is a threat since most of them are self employed and mat making is one of the activities they participate in as part of self employment to support their livelihoods. Most of the male respondents disagreed that mat making is a threat to Kingwal wetland's conservation and this may be attributed to the fact that majority of those who make mats are males and this activity is a source of income. This enables them to provide for their families since males are the breadwinners in most of the households surveyed.

Results showed that more than a half of respondents (52%) strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland's conservation. This agrees with findings of Wright and Wimberly (2013) who reported that clearance of wetland vegetation in the Western Corn belt of Minnesota has destroyed breeding areas of waterfowls. In the current study respondents' views were dependent on gender, education level and income. In relation to gender, more males than females strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland and this may be due to the fact that females look for fertile land to plant vegetables throughout the year and during dry seasons, and therefore view the land away from the wetland as productive. Females are forced to clear wetland vegetation to access fertile land for growing vegetables and therefore do not see how their action affects the wetland. In relation to education level,

respondents who had attained tertiary education strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland's conservation since most of them had knowledge on the negative effects of clearing of the wetland. It was evident that most of the respondents earning high income per year strongly agreed that clearance of wetland vegetation is a threat to Kingwal wetland as compared to those earning very low income and this maybe because those earning higher income are able to fully meet their family needs with their income and do not depend on the swamp.

Other threats cited during focus group discussion and interviews are human induced fire, noise cause by moving vehicles along the road, climate change, natural fire, encroachment by human beings and road accident kills wetland wild animals.

5.6. Measures Taken to Mitigate Threats Facing Kingwal wetland

Over forty percent of the respondents (48%) suggested fencing around the wetland to control the movement of wild animals out of the wetland. Similar findings were reported by Karanth *et al*. (2013). Fencing was suggested mainly by crop farmers majority of whom faced a problem of crop damage caused by wild animals from the wetland especially the Sitatungas. Respondents further alluded that fencing will prevent the animals from reaching people's farms and hence will minimize their chances of being killed.

Compensation of those facing human-wildlife conflicts was another measure that was suggested by 37% respondents. These findings agree with those reported by Moses *et al*. (2014) who noted that compensation around Amboseli National Park had helped local people reduce predation costs. Likewise, Kgathi *et al*. (2012) reported similar findings

from villages facing livestock predation by hyenas and lions in Botswana and suggested compensation based on losses incurred. According to the chief of Chepterit location compensation of those facing human-wildlife conflicts around Kingwal wetland would help minimize local residents' anger towards wildlife and also reduce retaliatory killing of problem animals. Kaptildil location chief also pointed out that people whose land runs through Kingwal wetland should be compensated for land they have lost to the wetland.

Some respondents (30%) proposed the establishment of community based conservation groups which would help them understand and promote conservation of Kingwal wetland. Similar observations were reported during focus group discussions with members from upper and middle Kingwal. Respondents reported that although there are conservation groups that were established in the study area 3-8 years ago, due to poor management they have not been effective in realizing their conservation objective.

Conservation based education was also suggested by the respondents to assist in creating awareness on Kingwal wetland, and minimize threats facing it. During focus group discussions with members of middle and lower Kingwal respondents reported that this would help create awareness among local people on the importance of conserving the wetland. These findings correspond to those of Wasswa *et al.* (2013) who reported that conservation-based education promotes positive attitudes among local people towards wetlands/natural resources since they will obtain knowledge on the importance of conserving such resources. Daryadel *et al.* (2014) also suggested that parties that are part of the Ramsar Convention have a duty to develop educational programs in their reserves to sensitize the public on wetland benefits (goods and services). KWS has been holding community meetings with local people in which they are taught to avoid threatening

Kingwal wetland and on the significance of conserving it. However this has not been effective according to the local people due to increasing human-wildlife conflicts with no compensation and due to lack of alternative sources of income generating projects to the local people. During focus group discussions, respondents alluded that the ineffectiveness of education programs around Kingwal is KWS to initiate its own programs of creating awareness without allowing participation of local people. The local people are however requested for an education program in order to support with the government to conserve the wetland.

Other measures suggested were planting of trees, setting it as a protected area, involvement of local people in conservation, government to sponsor community/individual project and the local people to be encouraged to take part in sustainable activities.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

This study concludes the following:

- Local people derive benefits from Kingwal wetland ranging from economic to education benefits and economic benefits are derived by most respondents. The local people also incur costs due to the presence of Kingwal wetland including crop damage, flooding during rainy seasons and provide breeding grounds for diseasing-causing micro-organisms.

- Part of Kingwal wetland inhabited by respondents, distance of respondents' homes from the wetland and income level of respondents have a significant influence on respondents' willingness to pay for the benefits derived from the wetland.

- Kingwal wetland's estimated economic value is Ksh. 549,442 (USD 5494.42) or Ksh. 2012.6/ha/yr with the direct value contributing the highest.

- Threats facing Kingwal wetland include poaching, eucalyptus planted close to it, extraction of clay from the wetland for brick making, human induced fire, climate change, wildfire, encroachment by human beings and road accident kills wild animals.

- The main measures that should be set up and implemented in order to mitigate threats facing Kingwal wetland and as a result conserve it are fencing in order to control the movement of wild animals in and out of the wetland, compensation of those facing

human-wildlife conflicts and formation of community based conservation groups. Others measures given include use of conservation based education programs, encouragement of indigenous tree planting along the wetland, designating Kingwal wetland as a protected area, government to support community/individual projects such as building a school and/or sponsoring education for some local people's children, encouragement of sustainable activities like basket making and involvement of the local community/people in conservation.

6.2. Recommendations

6.2.1. Policy and Management Recommendations

Based on the findings of the study, the following recommendations are made:

- The county and national governments should formulate and implement policies governing human activities done within or close to Kingwal wetland in order to safeguard it from unwarranted threats and promote its sustainability.
- KWS, KFS, NEMA and other conservation institutions should set up an active conservation-based education program involving local people living around Kingwal wetland to create awareness on benefits people should obtain from the wetland and how they should extract them without threatening the wetland.
- The government should compensate local people facing human-wildlife conflicts around Kingwal wetland.
- The government should negotiate with local people living around Kingwal wetland to allow its designation as a protected area, fence it and compensate people owning land within it.

- The County and/or national government should support community/individual projects to minimize threats facing the wetland to enable local people take up conservation as a land use option.
- Local residents should be encouraged to undertake activities like basket making, mat making and broom making among others on a sustainable basis to minimize over extraction of resources from the wetland.
- Local people should be encouraged to plant indigenous trees that preserve water and the environment as opposed to eucalyptus which used a lot of water.

6.2.2 Recommendations for further research

Further research should be undertaken on the following:

-Multi-analysis of Kingwal wetland's economic value using more than one method of natural resource valuation.

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APPENDICES

APPENDIX I: QUESTIONNAIRE FOR THE LOCAL PEOPLE

Introduction

My name is Gladys Cherono. I am a master's student at the University of Eldoret and I am undertaking a study on an economic valuation of the benefits of Kingwal wetland to the local people. This research is for academic purposes. You are humbly requested to spare a few minutes to answer questions given in this questionnaire. All the answers will be treated confidential and used only for the purpose of this study.

Section I: Socio-demographic characteristics of the respondents

1. Gender [1] Male [2] Female
2. Age group in years. [1] Under 15 years [2] 15-29 years [3] 30-44years [4] 45-59 years [5] 60 years and above
3. Education level. [1]None [2] Primary [3] Secondary level [4]Tertiary level (specify)
4. Occupation …….
5. Distance of home from Kingwal wetland in kilometers (km).
   [1] 0-500m [2] 0.5-1km [3] 1-1.5km [4]1.5-2km [5] 2-2.5km [6] 2.5-3km [7] 3-3.5 km [8] 3.5-4km [9] 4-4.5km [10] 4.5-5km [11] Over 5km
6. Average monthly income of the household in Ksh…….....
7. Size of the family…….....

Section II: Benefits accrued and costs incurred from Kingwal Wetland.

8. Do you obtain any goods and/or services from Kingwal wetland? [1] Yes ( ) [2] No ( )
9. (a) If yes in question 8 above, Indicate using the table below, the benefits that accrue to you from Kingwal wetland (Tick against the benefits you obtain) and also indicate the specific service and/or good using letters as guided in the table.

Table 1: Guide to filling answers for table 2 on question 9.

Goods and/or services	**Specific service/good**
Recreational benefits	**1**-Hiking; **2**- Photograph taking; **3**-Swimming; **4**- Bird watching; **5**-Game viewing; **6**-Any other. (Specify).....
Medicinal benefits	**1**-Extraction of herbal plant parts e.g roots, fruits, leaves and barks of trees. **2**-Any other form of medicine derived.
Nutritional benefits	**1**-Fish**; 2**-Edible birds; **3**-Game meat from mammals. (Specify the animal); **4**-Traditional vegetables; **5**- Any other benefit (specify)
Socio-cultural benefits	**1**-Wetland used as traditional historical site for e.g for circumcision; **2**- Wetland used for historical religious services e.g cleansing service and baptism; **3**- Any

	other service (specify)
Economic/commercial benefits	Extraction of the following for sale; **1**-Timber; **2**-Firewood; **3**-Brick making; **4**-Game meat; **5-**Fish;**6**-Reeds for mat making and house thatching; **7**-Clay for smearing of houses; **8**-Grazing of livestock in areas adjacent to the wetland**; 9**-Any other (specify)
Education and scientific research benefits	**1**-Research/studies done within or around the wetland; **2**-Educational trips to the wetland undertaken by students. **3**-Any other. (specify)
Water benefits	**1**-Water for washing clothes and utensils; **2**-Water for cooking and drinking; **3**-Water for irrigation; **4**-Water for livestock use; **5-**Any other. (specify)

Table 2: Table to be filled for question 9a

Services/goods	[1]**Yes**	[2]**No**	**Specific service/good**
Recreational Benefits			
Medicinal Benefits			

Nutritional Benefits			
Socio-cultural Benefits			
Economic Benefits			
Educational and research Benefits			
Water Benefits			
Flood control benefit			
Carbon sink helping purifies air.			
Nutrient retention and supply which increases crop production.			

10. (a) Besides the benefits listed in table 2 above, are there any other services and/or goods obtained from Kingwal wetland directly or indirectly? [1]Yes [ ] [2]No [ ]

(b) If yes, indicate in the space below these other goods and services you obtain.

……

……

……

……

……

……

11. If no in question 10(a) above, state why you do not obtain any benefits/services.

……

……

12. Which of the following costs do you incur due to the presence of Kingwal wetland and what it harbours? Use the table below to indicate the cost incurred and source (i.e problem animal causing it).

Cost	**Yes or No**	**Problem animal**
Crop damage by wildlife		
Human injury/death by wild animals		
Livestock injury/death by wild animals		
Diseases brought by wildlife to livestock and human beings		
Competition over resources with livestock		
Children missing school due to fear of meeting wild		

animals on the road.		
Damage to infrastructure e.g fences, roads, water pipes among others		

13. If there are any other social costs you have incurred from the wetland, indicate them in the table below and specify the problem animal causing it.

Other costs incurred	**Cause of the losses**
1.	
2.	
3.	
4.	

Section III: Respondents' willingness to pay for benefits accrued from Kingwal wetland

14. If you are asked to pay for the benefits you have mentioned in questions 8 and 9 above are you willing to pay for them? [1] Yes [ ] [2] No [ ]
15. Using the table below, indicate the maximum monetary value you are willing to pay for the benefits you have mentioned in question 9 above per year and if you are not willing to

pay, give reasons using numbers as given in the guide below the table. Use the amount given in the bracket (below Ksh10000, 10000-20000, 20001-30000, 30001-40000, 40001-50000, 50001-60000, 60001-70000, 70001-80000, 80001-90000, 90001-100000, over 100000Ksh)

Guide for Reasons for Not Willing to Pay.

1- The benefit does not deserve any monetary value.

2- You do not want to give the benefit any monetary value.

3- You don't have money to pay for the benefit if you were to be charged for it.

4- You don't have any idea on how much the benefit is worth in money form.

5- Any other reason (Specify).....

Benefits derived	**Amount (Ksh)**	**Reasons for not willing to pay**
Recreational benefits		
Medicinal benefits		
Nutritional benefits		
Cultural and spiritual benefits		
Commercial/economic benefits		

Education and scientific research benefits.		
Water benefits		
Flood control		
Carbon sinks which help in air purification.		
Nutrient retention and supply		

16. How much are you willing to pay for the goods and services you mentioned in question 10 (b)

Other service and/or good	**Amount (Ksh)**	**Reasons for not willing to pay**

17. How much are you willing to pay to protect and conserve Kingwal wetland in order to provide its services in future for the current human generation? Use the amount given in the bracket (below Ksh10000, 10000-20000, 20001-30000, 30001-40000, 40001-50000, 50001-60000, 60001-70000, 70001-80000, 80001-90000, 90001-100000, over Ksh100000

    ……

18. How much are you willing to pay to preserve Kingwal wetland in order to provide its benefits to the future generation? Use the amount given in the bracket (below Ksh10000, 10000-20000, 20001-30000, 30001-40000, 40001-50000, 50001-60000, 60001-70000, 70001-80000, 80001-90000,90001-100000,over Ksh 100000

    ..…….....**.....**

19. How much are you willing to pay to ensure that Kingwal wetland remains as a natural area? Use the amount given in the bracket (below Ksh10000, 10000-20000, 20001-30000, 30001-40000, 40001-50000, 50001-60000, 60001-70000, 70001-80000, 80001-90000, 90001-100000, over Ksh100000

    .....

Section IV: Threats facing Kingwal wetland/swamp

20. Do you agree that the following activities are threatening/negatively affecting Kingwal wetland? Tick in the spaces provided based on your level of agreement.

Activity	Strongly agree	Agree	No idea	Disagree	Strongly disagree
Poaching					
Use of chemicals on agricultural farms					
Cultivation of areas close to the wetland especially during dry seasons					
Planting Eucalyptus close to the wetland					
Brick making					
Mat making					
Clearing of wetland vegetation.					

Section V: Measures to mitigate threats facing Kingwal wetland

21. In your own opinion, what should be done to improve conservation of Kingwal wetland?.....

.....

22. a) Is there any conservation group formed around Kingwal wetland? [1]Yes ( ) [2] NO (

b) If yes in a) above, state the name the group(s)

……

……

APPENDIX II: GUIDE QUESTIONS FOR KEY INFORMANTS

1. Gender of respondent----------Position held in government and/or community----------
2. What goods and services are obtained by local people from Kingwal wetland?
3. If you were asked to charge the local people for the services and goods obtained from Kingwal wetland, how much are you willing to accept as payment for the services and goods you have listed in question 2 above?
4. What problems do local people living around Kingwal wetland face due to the presence of the wetland and what it harbors?
5. What causes the problem(s) you have stated in question 4 above?
6. What threats are facing Kingwal wetland?
7. What measures have you and other conservationists/local/national authorities adopted to mitigate threats facing Kingwal wetland?
8. Have the measures you have listed in question 7 above been effective in mitigating the threats facing Kingwal wetland?
9. In your view what is the future of Kingwal wetland?

APPENDIX III: GUIDE QUESTIONS FOR FOCUS GROUP DISCUSSION

1. What benefits (goods and services) do you obtain from Kingwal wetland?
2. What problems/losses do you incur due to the presence of Kingwal wetland and what it harbors?
3. What are the causes of the problem(s) or loss(es) you experience?
4. a) If you are asked to pay for the benefits you have mentioned in question 1 above, how much are you willing to pay for each of them?

   b) If you are not willing to pay as indicated in 4 (a) above, give reasons why.

   5. How much are you willing to pay to protect and conserve Kingwal wetland for it to provide its goods and services for the current human generation and in future?

   6. How much are you willing to pay to preserve Kingwal wetland in order to provide its benefits to the future generation?

   7. How much are you willing to pay to ensure that Kingwal wetland remains as a natural area?

   8. Which activities are threatening/negatively affecting Kingwal wetland?

   9. What should be done to improve the conservation of Kingwal wetland and minimize threats facing it?

   10. Is there any conservation group(s) around Kingwal wetland? [1]Yes ( ) [2] NO ( )

   11. If yes in question 10 above, state the name(s) of the group(s).

APPENDIX IV: RESPONSES FROM KEY INTERVIEWS

Issue discussed: Goods and services obtained by local people from Kingwal wetland as per the key informants are: -Economic/commercial benefits: Reeds for making mats, Grasses for house thatching and livestock grazing especially during dry seasons, Clay soil for bricks making, firewood and charcoal. -Water benefits: Water for drinking by livestock, washing clothes, bathing, washing utensils, irrigating crops and tree seedlings, fish rearing and supporting vegetable and crops like maize during dry seasons. -Nutritional benefits - Fish, wild edible fruits like water berries -Eco-tourism and recreational benefits: Viewing of wild animals especially Sitatunga and bird watching. -Socio-cultural benefits for instance	**Issue discussed:** Amount key informants were willing to accept as payment for the services and goods obtained by the local people. Some were unable to give the monetary value of the benefits but others gave the following monetary values: -Grass for house thatching- Ksh. 100 per bundle. -Soil for bricks making- Ksh. 5 per wheelbarrow. -Grasses for livestock grazing Ksh. 200 per individual per month. -Reeds for making mats- Ksh. 150 per extraction. -Water for drinking by livestock, washing clothes and other domestic purposes- Ksh. 5 per 20 litters.

circumcision ceremonies are done within the wetland.	-Game viewing and bird watching- Ksh. 100 per adult and Ksh. 50 per children.
Problems/cost faced by the local people living around Kingwal wetland and their causes according to key informants were: -Crop damage especially maize, kales (sukuma wiki), young cabbages, and beans by Sitatunga antelopes yet the local people are not compensated. -Water is infested with liver flukes which cause fascioliasis in livestock especially during rainy seasons. -Papyrus/Reeds have encroached people's land and clearing them is hard since KWS does not allow people to clear them. -The wetland harbors mosquitoes which causes malaria. -Flooding during rainy seasons have forced	**Threats facing Kingwal wetland according to key informants were:** -Over cultivation which leads to soil erosion which affect the pattern of the wetland -Eucalyptus plantation uses a lot of water hence lowers the water level in the wetland thus affecting aquatic animals which need a lot of water and if not controlled will result to the wetland drying up. -Wild and human induced fires caused by lighting cigarettes during dry seasons destroy wetland vegetation and drive wild animals away. -Brick making has resulted in diversion of water away from the wetland and this

some local leaders like Chepterit location chief and assistant chief to re-locate people facing flooding during these seasons. -Disruption of transport system during rainy seasons due to flooding. -Increased waterborne diseases/infections to human beings during rainy seasons due to sewerage waste mixing with water used for domestic purposes. -Human injury caused by snakes especially pythons. -Conflict over ownership of the wetland. Local people claim it is part of their ancestral land while the government claims it is public land since all wetlands are rated as public lands	may lead to the wetland drying up. -Encroachment on the wetland due to immigrations to areas adjacent to the wetland because the cost of land is cheaper. -Animal poaching particularly the sitatunga is done secretly since KWS has banned it and people caught poaching animals are heavily fined. -Noise produced by people/vehicles is chasing the sitatunga away and that is partly the reasons lowering their numbers. -Road accidents are also a threat to Sitatunga antelopes and other animals. Segut village elder reported that he has witnessed one road accident which caused the death of one Sitatunga antelope. -Chemicals used by human beings flow

	to the wetland causing pollution. -Soil erosion from the wetland during rainy seasons. -Habitat destruction due to human encroachment. -Climate change. -Overgrazing by the local people. -Political problems. Some politicians come up with projects such as encouraging people to plant eucalyptus in order to absorb wetland water that have extended to their farms and this threaten the wetland. -Conflict over ownership of land covered by the wetland between the local people and the government since the area according to the KWS assistant warden is a public land.
Measures adopted to mitigate threats facing Kingwal wetland according to key	

informants are:

Some local people have been educated on the importance of the wetland to them and how they can conserve it.

People are encouraged to plant trees especially indigenous trees since they preserve water unlike exotic trees like eucalyptus. Kingwal Swamp Conservancy Trust Fund (KSCTF) had given seedlings to plant around the wetland but unfortunately most seedlings died.

Policing: People found poaching are taken to court and released after being fined. Policing was reported to be a very effective measure implemented by KWS.

KSCTF, an NGO has help the local people to build bee hives, practice zero grazing and plant bamboos and other indigenous trees along the wetland.

KWS officials have been holding public meetings with the local people to educate them to avoid threatening the wetland and create awareness of the wetland's value to them.

KWS in co-ordination with KFS have encouraged farmers to plant indigenous trees along the riverine.

Poachers are arrested. This policy which is within the 2013 Wildlife Conservation and Management Act has been effective.

KWS has trained and employed scouts to guard the wetland.

KWS has encouraged local people to form community based organizations but at the

moment they are not active due to poor management.

Measures proposed for adoption by key informants

-Compensation of people whose lands are covered by the wetland and those whose crops are damaged by the sitatunga to lower the anger of the local people towards wild animals bringing conflict.

-Demarcation of the wetland to establish clear boundaries between farmers' land and the wetland.

-Stop human activities threatening the wetland.

-Effective community based conservation groups to be created to help local people participate in the conservation of the wetland. Alluded that although there are some community based conservation groups, they have not been effective due to poor management.

-People living adjacent to the wetland should be evicted to areas far away from the wetland to mitigate threats facing it and to reduce the chances of being affected by flood water during rainy seasons which has given the location authority a problem when many a times they are forced to move them to raised areas during rainy seasons.

-Government should seek for donors e.g NGOs to fund the formation of more community based organizations to create ways for local people to participate in the wetland's conservation.

-The government and/or conservation bodies should create nature trails which will help people pass through while viewing animals in the wetland.

-Fencing around the wetland after compensating those whose land cuts across it.

-Creation of alternative sources of income.

APPENDIX V: SUMMARY OF RESULTS FROM KEY INFORMANT INTERVIEWS

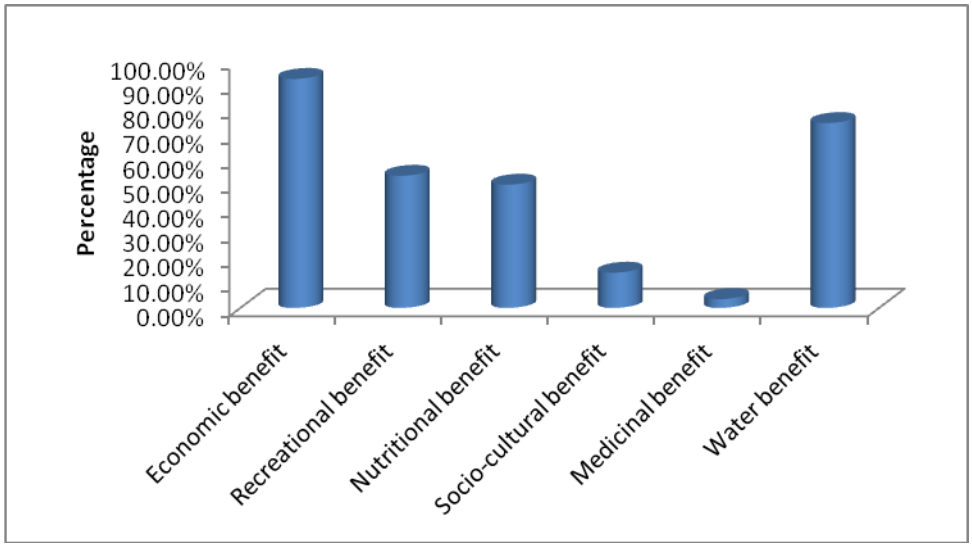


Figure a): Benefits derived by local people from Kingwal wetland according to key informants

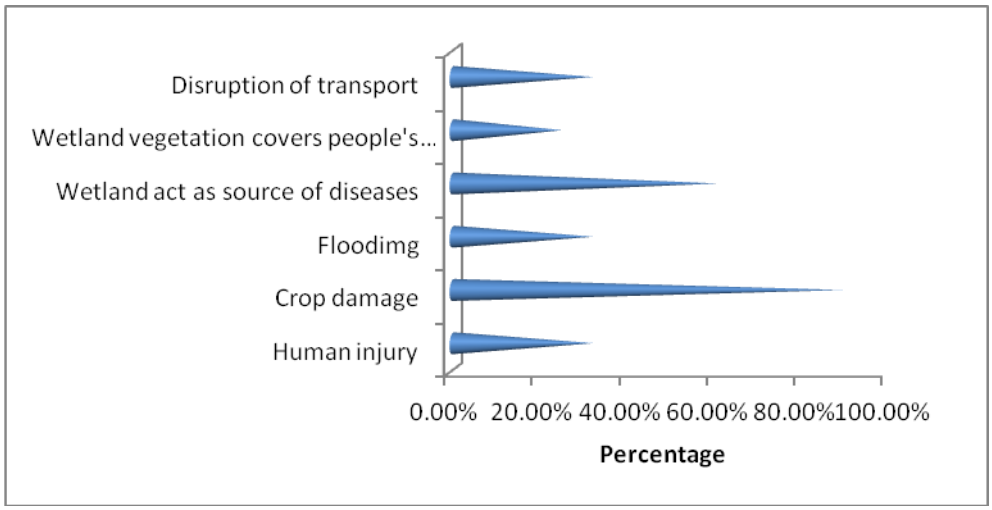


Figure b): Costs incurred by local people from Kingwal wetland according to key informants

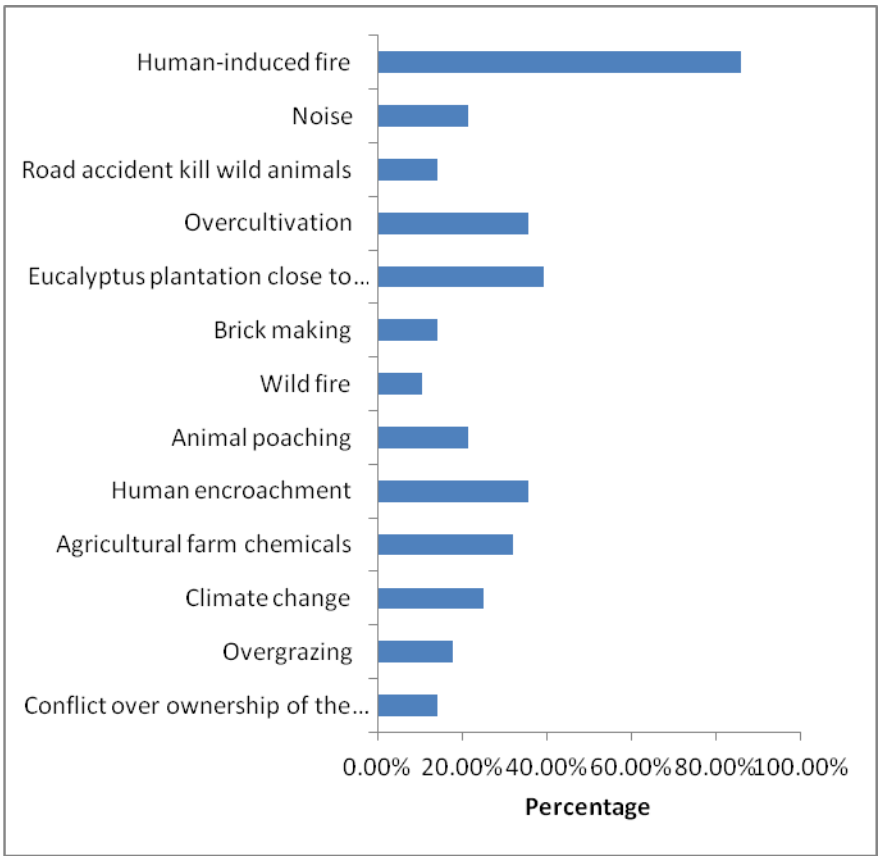


Figure c): Threats facing Kingwal wetland according to key informants

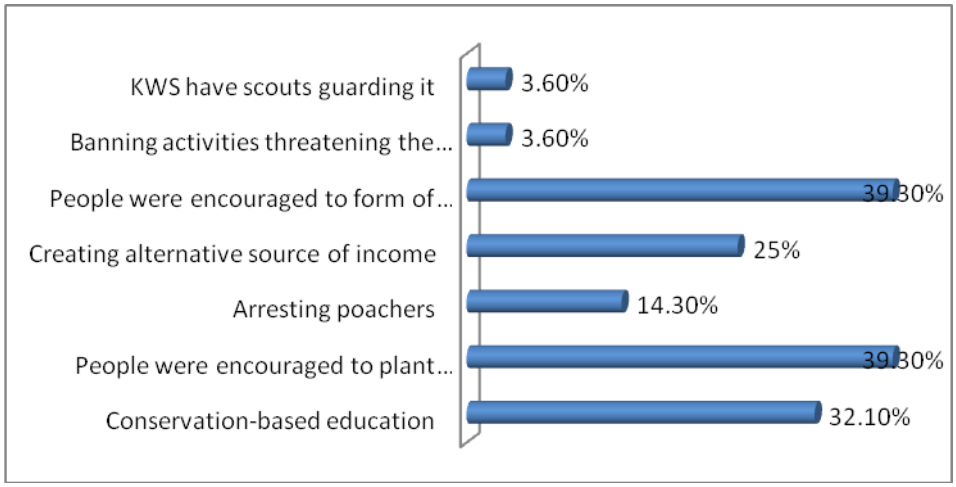


Figure d): Measures adopted by key informants to mitigate threats facing Kingwal wetland

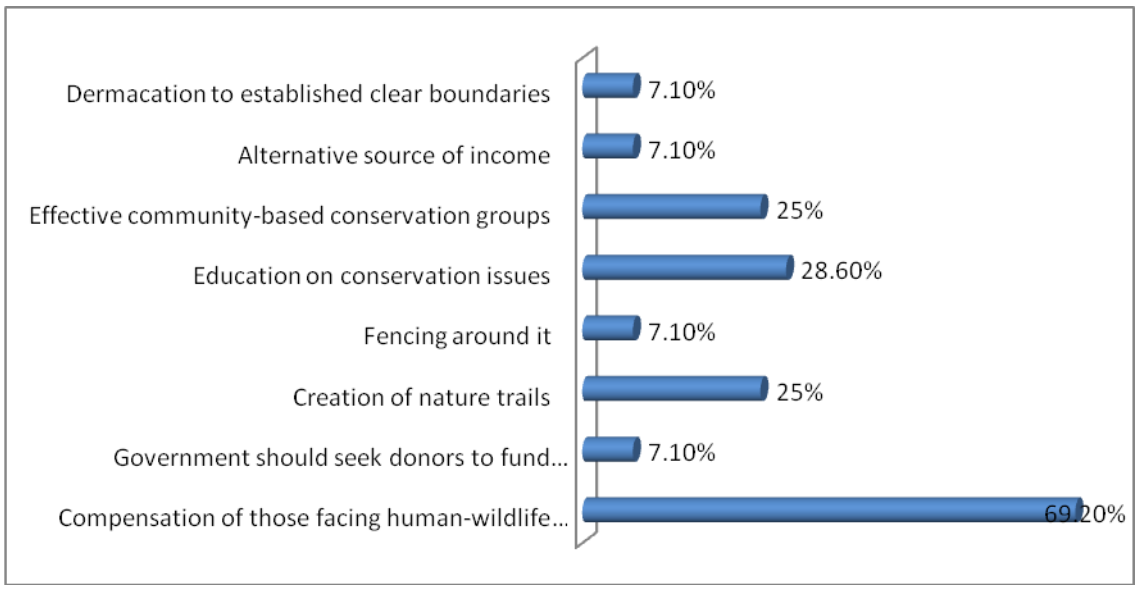


Figure e): Measures proposed by key informants for adoption

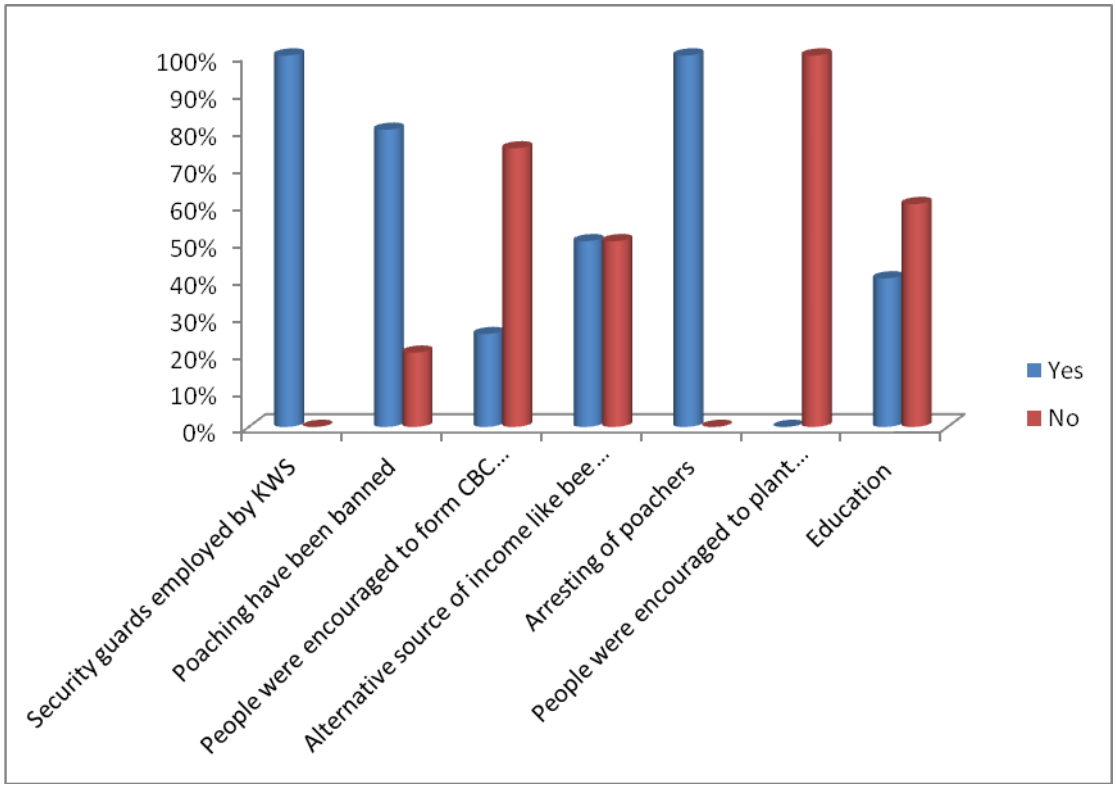


Figure f): Views on whether measures adopted to mitigate threats facing Kingwal wetland are effective or not

APPENDIX VI: RESPONSES FROM FOCUS GROUP DISCUSSIONS

Issue discussed: Benefits (goods and services) obtained by local people from Kingwal wetland	**Issue discussed:** Social cost/problems incurred by local people from Kingwal wetland and what causes them
Economic benefits. Local people they obtain at least one of these economic benefits: Reeds and papyruses for making mats and seats, grasses for thatching living and business houses, grazing livestock especially during dry seasons, clay for smearing houses and brick making, trees for obtaining firewood and charcoal for cooking and sale among others. Water benefits: Local people reported that they obtain water for domestic purposes like washing clothes and utensils, drinking by livestock, irrigating crops especially in dry seasons among others. Socio-cultural benefits: Local people stated that they use Kingwal wetland in performing	Crop damage by Sitatunga antelopes. Death of Poultry caused by mongooses that eat them. Cows get stuck in the wetland. The wetland bring diseases like malaria to people transmitted by mosquitoes found in it, pneumonia, typhoid and bilharzia to people, trypanasomiasis transmitted to livestock by wild animals found in it, fasciolasis to livestock caused by liver flukes found in wetland water. The wetland has covered a lot of people's land. The wetland has brought about

circumcision ceremonies. Nutritional benefits: Local people stated that they obtain edible wild fruits like water berry, fish, wild mushroom, wild vegetables including vine spinach *Basella alba* (nderema) and black night shade (managu) among other edible things. Touristic benefits: Most local people especially those at middle age were reported to have undertaken recreational activities within the wetland including swimming, photography, hiking and eco-tourism	flooding of nearby farms/land during rainy seasons displacing people found in those areas. Snakes found within the wetland have injured a number of people. The wetland is reported to have been disposal area for people killed elsewhere. Flooding during rainy seasons caused transportation/communication problems and has even prevented children from going to school.

including bird watching and wild animal viewing. Medicinal benefits: Some discussion groups reported that they obtain medicinal goods especially for small children and curing illnesses in livestock from the wetland. Ecological benefits: The wetland has enabled local people to access different animals including the Sitatunga, mongoose, tortoises, porcupines, birds and insects including butterflies among others. The wetland is also adored for its educational and research value. Local people stated that it is a place where students can get conservation knowledge, knowledge about wild animals and plants and also for undertaking research.	**Issue discussed**: How much the local people are willing to pay to protect and conserve Kingwal wetland in order for it to provide its goods and services for the current human generation and in future Range=Ksh. 8,000 Minimum=Ksh. 3,000 Maximum=Ksh. 11,000 Mean=Ksh. 7,600 meaning the groups were Willing to pay Ksh. 7,600 per month as option value of the wetland.
Issue discussed: Amount respondents are willing to pay for benefits derived from Kingwal wetland.	**Issue discussed:** How much local people are willing to pay to preserve Kingwal wetland in order to provide its

Some of the focused groups were not willing to pay for the benefits obtained from the wetland because they stated that most of them have their land crossing the wetland and therefore resources from the wetland are their own resources. Some of the groups that were not WTP suggested that they were willing to accept payment from outsiders for using resources. A summary of their views on their WTA or WTP are given in tables 2a to 2f below.	benefits to the future generation Range=Ksh. 7,000 Minimum=Ksh. 2,000 Maximum=Ksh. 9,000 Mean=Ksh. 6,200 meaning the groups were willing to pay Ksh. 6,200 per month as bequest value of the wetland.
Issue discussed: How much the local people are willing to pay to ensure that Kingwal wetland remains as a natural area Range=Ksh. 7,000 Minimum=Ksh. 4,000 Maximum=Ksh. 11,000 Mean=Ksh. 8,000 meaning that the groups were Willing to pay Ksh. 8,000 per month as existance value of the wetland.	**Issue discussed:** Activities threatening/ negatively affecting Kingwal wetland according to the local people. Human induced fires. Pollution caused by chemicals carried into it by running water from people's farm, waste disposal and vehicles being washed near the wetland. Chemicals kill fishes and wild

	vegetables. The eucalyptus plantation near the wetland used a lot of water minimizing the wetland water. Animal poaching especially Sitatunga. Encroachment through farming which has interfered with medicinal and other important plants. Brick making interferes with landscape and create areas where water drains away from the wetland hence may dry up due to this. It has also caused water pollution in the wetland.
Issue discussed: Measures to improve the conservation of Kingwal wetland and minimize threats facing it. Encourage conservation-based education. Encourage people living close to the wetland to plant indigenous trees.	**Issue discussed:** Whether there is any conservation group(s) around Kingwal wetland and their name(s) All the respondents agreed that there are some conservation groups that have been formed within the area including Kingwal Swamp

Encourage people living close to the wetland to participate in alternative sources of income like bee-keeping. Encourage people to participate in sustainable activities like basket making, mat making, and establishment of tree nurseries, eco-tourism, and construction of cultural centers among others. Water should be pumped for crop irrigation to minimize people cultivating close to the wetland during dry seasons. The local/national government should negotiate with the local people on how to promote Kingwal wetland conservation and not to use force. Local people are ready to partner with donors/conservationists/government in conserving the wetland. KWS should help the local people in establishing Community-based conservation	Conservancy Trust Fund (KSCTF), Kingwal Wildlife and Environmental organization, Center of Community Dialogue and Development and Kimibik Organization. KSCTF was established in 2013 and Kimibik organization in 2012. These groups were reported to be inactive due to poor management and lack of operational funds.

groups (CBCs) Students/researchers should be encouraged to join CBCs Both the national and county/local governments should sponsor local people in their projects like farming and/or educating their children to encourage them preserve the wetland. The government should come up with measures to minimize soil erosion near and along the wetland.	

APPENDIX VII: A GRAPHICAL PRESENTATION OF FOCUS GROUP DISCUSSION RESULTS

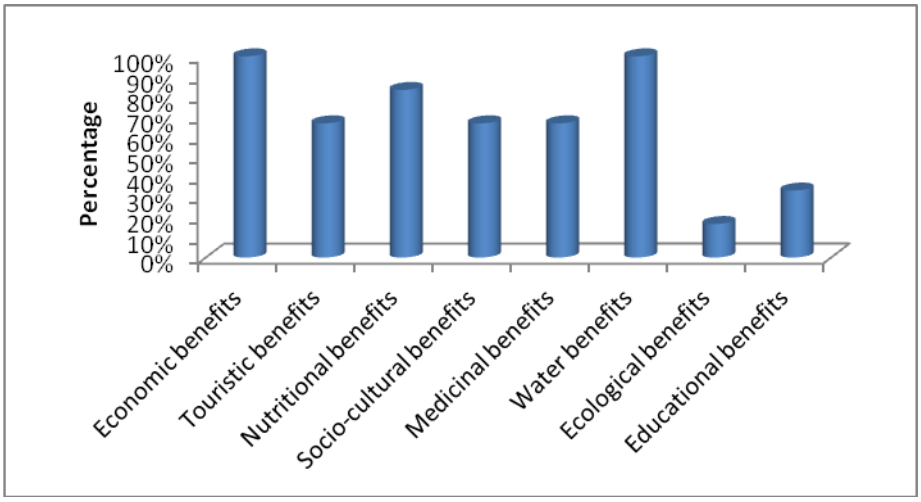


Figure g): Benefits derived by local people from Kingwal wetland according to focus groups

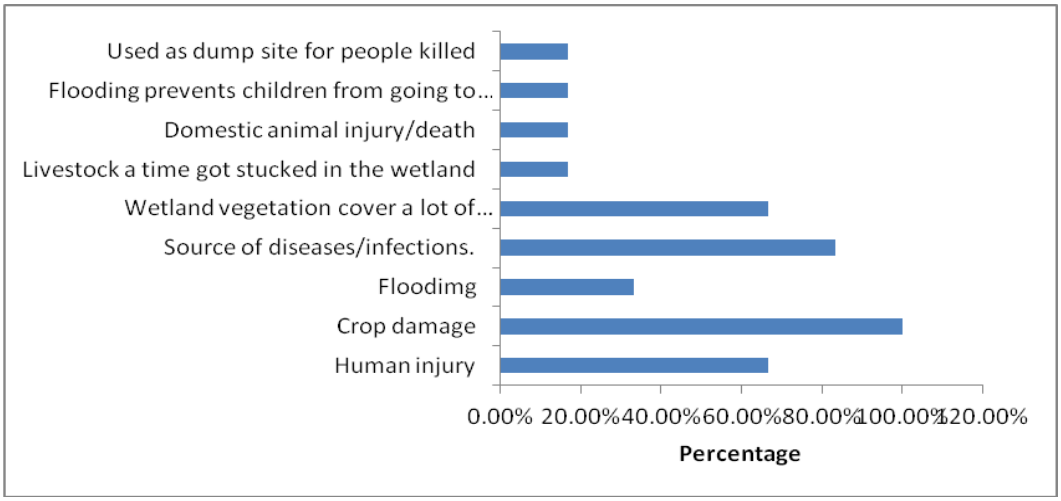


Figure h):Costs incurred by local people from Kingwal wetland according to focus groups

Table 1: Views of Chepterit Group on WTP/WTA for Benefits from Kingwal wetland

Benefit	**WTP**	**WTA**
Water	Not WTP	Ksh. 20 per 20 liters
Firewood (papyruses)	Not WTP	Ksh. 50 per bundle
Firewood (from trees)	Not WTP	Ksh. 10 per piece
Swimming		Ksh. 150-1000 per individual
Fish		Ksh. 150 per adult individual
fruits		Ksh. 50 per glass
Reeds for making mats and seats		Ksh. 1000 per bundle

Table 2: Views of Kapsisiywa group from lower Kingwal on WTP/WTA for Benefits from Kingwal wetland

Benefit	**WTP**	**WTA**
Grass for livestock grazing		Ksh. 300 per acre per month
Clay for smearing		Ksh. 1500 per lorry
Reeds for mat making		Ksh. 500 per bundle
Fish		Ksh. 200 per individual
Grass for thatching		Ksh. 100 per bundle

Table 3: Views of Kapchesir Group from upper Kingwal on WTP/WTA for Benefits from Kingwal wetland

Benefit	**WTP**	**WTA**
Grass for thatching	Ksh. 100 per bundle	
Water	Ksh. 40 per 20 liters	

Grass for livestock grazing	Ksh. 200 per individual per month	
Reeds for mat making	Ksh. 500 per bundle	
Soil for bricks and smearing houses	Ksh. 150 per wheelbarrow	
Socio-cultural	Not WTP	
Medicinal	Not WTP	

Table 4: Views of Kiptenden group from upper Kingwal on WTP/WTA for Benefits from Kingwal wetland

Benefit	**WTP**	**WTA**
Water benefit	Ksh. 30 per 20 liters	
Educational benefit	Ksh. 100 per student	
Nutritional benefit	Ksh. 500 per month	

Medicinal benefit	Ksh. 100 per any medicine extracted	
Socio-cultural benefit	Not WTP	

Table 5: Views of Kosirai group from Middle Kingwal on WTP/WTA for Benefits from Kingwal wetland

Benefit	**WTP**	**WTA**
Water	Ksh. 50 per 20 liters	
Grass for thatching	Ksh. 120 per bundle	
Grass for grazing livestock	Ksh. 50 per individual per month	
Reeds for making mats and seats	Ksh. 150 per bundle	
Soil for smearing and making bricks	Ksh. 100 per wheelbarrow	
Recreation	Not WTP	
Socio-cultural	Not WTP	

Tourism	Ksh. 50 per child and 100 per adult	

Table 6: Views of Kaptildil group from lower Kingwal on WTP/WTA for Benefits from Kingwal wetland

Benefit	**WTP**	**WTA**
Fruits		Ksh. 40 per glass
Water		Ksh.35 per 20 liters
Livestock grazing		Ksh. 100 per individual per month

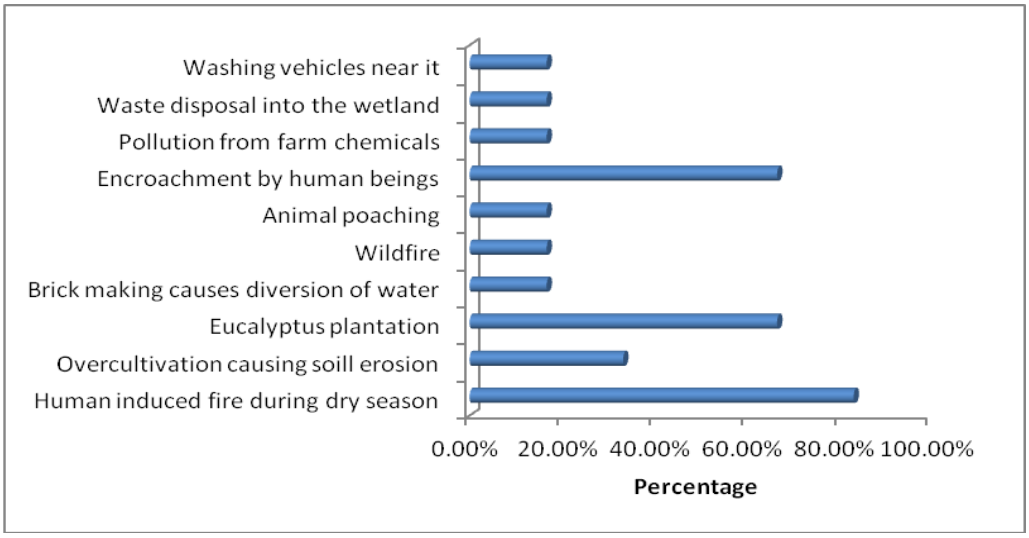


Figure 9: Threats facing Kingwal wetland according to focus groups

Table 7: Measures suggested by local people to minimize threats facing Kingwal wetland and conserve it.

Measure suggested	Percentage of groups
Compensation for crops damaged by animals	66.7%
Conservation-based education	83.3%
People be encouraged to plant indigenous trees	50%
Creating alternative source of income	83.3%
People/students/researchers be encouraged to join of CBCOs	66.7%
Fencing	83.3%
Compensation for people’s land covered by the wetland	16.7%
Banning activities threatening the wetland	16.7%
Government to partner with local people in conserving it	33.3%
KWS should encourage local people to form CBCO's	66.7%

Local people want to partner with conservationists or government	50%
Water should be pump for irrigation to minimize wetland cultivation	33.3%
Local people need donors to support in projects	16.7%
Benefits to be shared with local people	16.7%
Government/donors should sponsor local people in projects like child education	50%

APPENDIX VIII: PHOTOGRAPHS OF FOCUS GROUP DISCUSSIONS

The following pictures were taken during focus group discussions with local people living around Kingwal wetland:

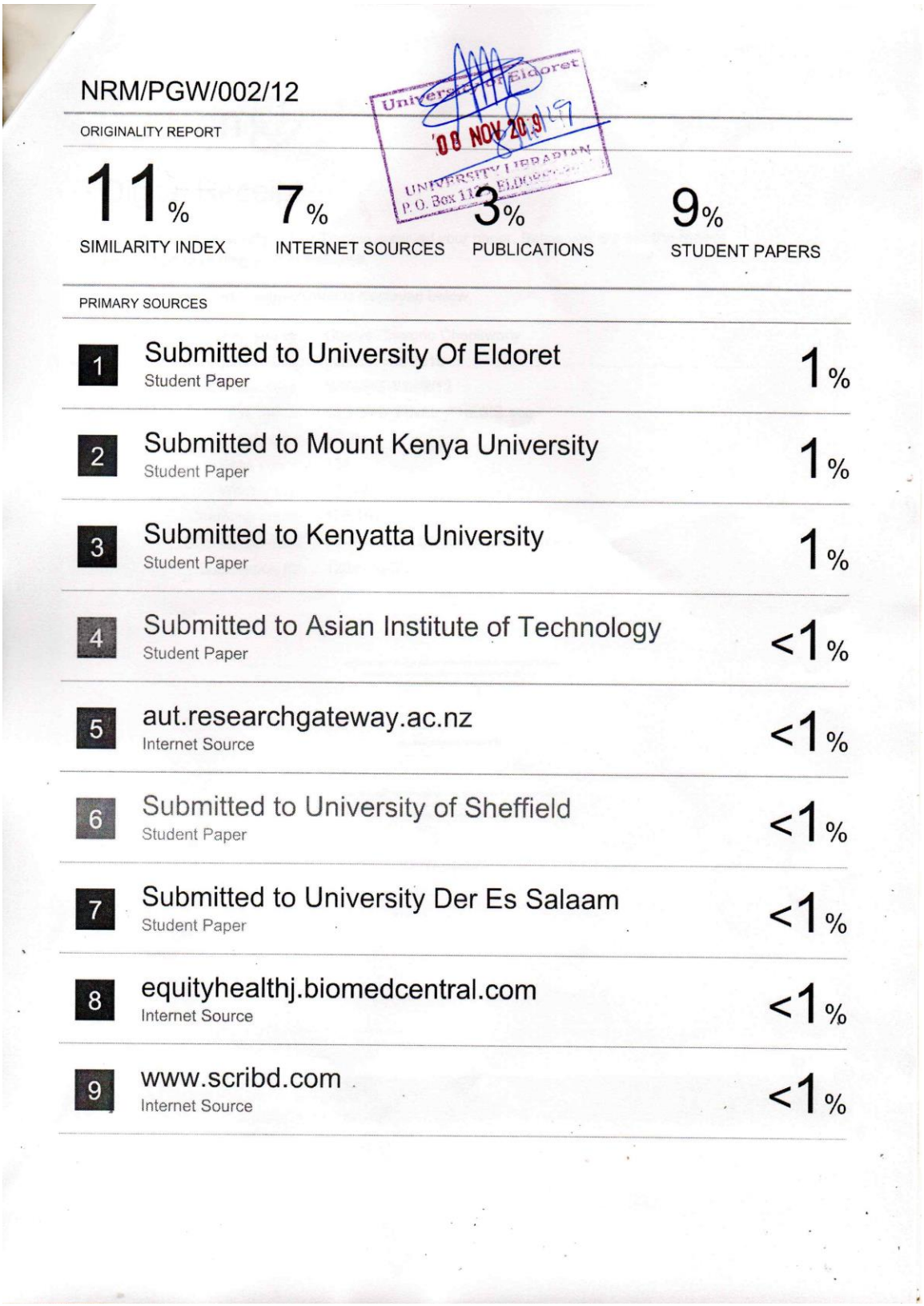
Plate 10: A focus group discussion with respondents from upper part of Kingwal wetland (Kiptenden)

Plate 11: A Focus group discussion with respondents from middle part of Kingwal wetland (Kosirai location)

Plate 12: A Focus group discussion with respondents from lower part of Kingwal wetland (Kapsisiywa Location)

Plate 13: A Focus group discussion with respondents from middle part of Kingwal wetland (Chepterit Location)

APPENDIX IX: SIMILARITY INDEX/ANTI-PLAGIARISM REPORT



NRM/PGW/002/12

ORIGINALITY REPORT

11%	7%	3%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University Of Eldoret Student Paper	1%
2	Submitted to Mount Kenya University Student Paper	1%
3	Submitted to Kenyatta University Student Paper	1%
4	Submitted to Asian Institute of Technology Student Paper	<1%
5	aut.researchgateway.ac.nz Internet Source	<1%
6	Submitted to University of Sheffield Student Paper	<1%
7	Submitted to University Der Es Salaam Student Paper	<1%
8	equityhealthj.biomedcentral.com Internet Source	<1%
9	www.scribd.com Internet Source	<1%