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Impact of Riparian Community's livelihood strategies on Wetlands Conservation in Murang'a County, Kenya

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***Abstract*: Wetlands, all over the world, offer many livelihood support services to riparian communities and beyond but are currently severely threatened with decimation. In Murang'a County, Kenya, wetlands are a key life support system for many communities but their survival is currently uncertain due to extensive encroachment, filling up, pollution and weak legislation. Our study aimed at investigating the impact of riparian community's livelihood strategies on wetlands conservation and restoration in Murang'a County, Kenya. Data was collected in 4-sub counties of the County using household's survey questionnaires, key informant interviews, and focus group discussion. A randomly selected sample of 404 respondents were recruited for the study. Data was analyzed using SPSS software version 26.0. Results showed an encroachment rate into the wetlands by the riparian communities of 60.4%. A highly significant and positive correlation was obtained between livelihood strategies and impacts on wetlands ((r=0.184, p value =0.001). Members of the riparian communities were poorly informed about the roles of wetlands, with 70% unaware of any wetland's conservation efforts. A whopping 73.7% had not participated in any wetland conservation effort. Hence, there is need for community sensitization and empowerment on wetlands wise use as well as sustainable wetland utilization, conservation and management.**

***Keywords*: Riparian, Wetlands, Conservation, Restoration.**

1. INTRODUCTION

1.1 Background of the Study

Globally, wetlands cover about 6% of the 5.7 million km2 of the Earth's surface and they support millions of livelihoods as they act as ''water banks'' where water may be drawn and ground water replenished (Millennium Ecosystem Assessment, 2005). Wetlands are as old as the Earth itself. By 20th century, the increased use of wetlands attracted the attention of the world and a global meeting was held in Iran on 2nd February, 1971 to discuss wise use and conservation of lands that were wet (wetlands), the meeting was named the Ramsar Convention and it has been the foundation of wetlands conservation (Ramsar, 2017).

Wetlands have been places of interest since civilization as many towns and cities are built along the blue economy. They have also served as transport corridors, source of wildlife, fish and seeds (Fisher, K. and Morling, P.). However, due to population pressure, wetlands have been encroached into and converted to different agricultural land use and degraded Davidson, C. (2014), observes that 87% of the world's wetlands have been lost since 1700 AD as a result of human activities.

In the Kenyan economy, Lakes such as Lake Naivasha contributes 5.3 billion and over 30,000 people draw their livelihoods from wetlands ecosystem but due to climate change, these lakes are contemporarily facing rising water levels which in turn affects livelihoods of the communities that are depending on them for survival.

Murang'a County is endowed with many wetlands which in the past had provided aquatic life to fish and wild animals and provision of adequate water supply such as Ndakaini Dam does to the community and nearby urban centers. However, despite the numerous benefits of wetlands to riparian communities in Murang'a County, wetlands management and conservation continue to face myriad challenges such as encroachment, industrial development, lack of follow-up in livelihood strategies taking place near or in those wetlands, lack of a well-coordinated conservation efforts, alien species invasion (Murang'a County Integrated Development Plan, 2018). It is on this background that the study was carried out to assess the impact of riparian community's livelihood strategies on Wetlands conservation and restoration in Murang'a County, Kenya.

1.2 Purpose of the Study

The purpose of the study was to assess the impacts of riparian community's livelihood strategies on wetlands conservation and restoration in Kenya, with focus on Murang'a County.

2. LITERATURE REVIEW

2.1Theoretical Framework

The causal theoretical framework was developed and popularized by Organization for Economic Cooperation and Development (OECD). It is a response strategy to the concept of cause and effects relationship to wetlands wise use and their societal benefits, conservation and restoration. It has been widely used in sustainable development Index (SDI) initiatives. The causal theoretical framework conceptualized the pressure-state-response (PSR) approach and in this context, the pressure indicators represent the riparian's livelihood strategies, processes and patterns impacting on sustainable livelihood and development either negatively or positively as shown in Figure 1 below.

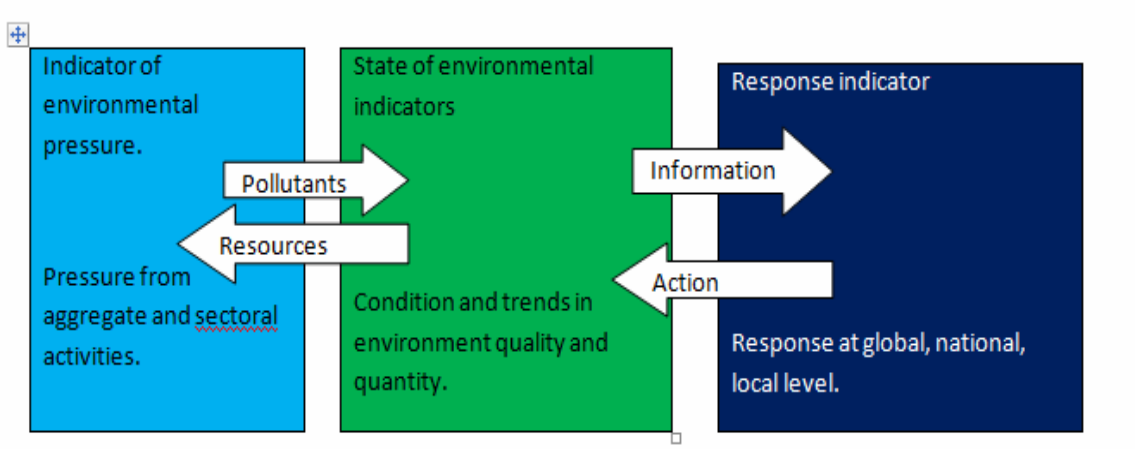

Figure 1: Pressure- State –Response (PSR) Framework

Source: OECD (2013).

2.2 Conceptual Framework

The dependent variable in this study is wetland conservation and restoration while the independent variable is sustainability of livelihood assets. The conceptual framework is based on sustainable livelihood framework which depicts that people operate in a context of vulnerability within which they have access to certain assets (Figure 2).

Assets gain more weight and value through the prevailing macro and micro institutional, social environment, and policies and processes, this context are what shape the livelihood strategies that are available to people in pursuit of their self-defined beneficial livelihood outcomes (Kollmaire, M. and Gamber, S. 2002). Gendered community based issues in wetlands conservation are quite significant in the realization of short and long term wetland management and restoration as the degradation of wetlands due to gender inequality, lack of access and control of natural resources and un balanced power relations manifest on wetlands conservation efforts in terms of budgetary allocation, community participation, technical support, creation of awareness and these are further influenced by policies, institutions, social, organization associations and processes.

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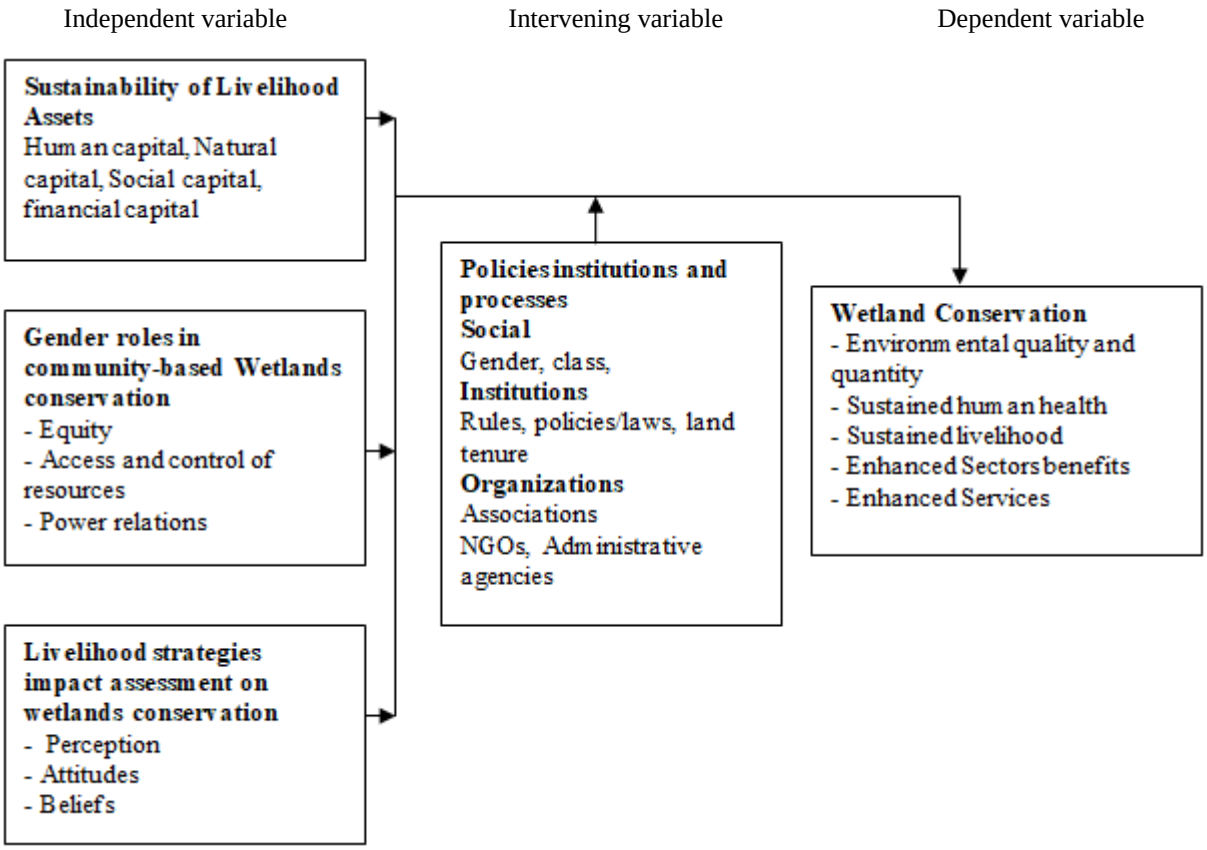

Figure 2: Conceptual Framework

2.3 Empirical Literature Review

Globally, Wetlands and rivers are among the most threatened ecosystems of humanity in the 21st century (Brinson, M. 1993). The contemporary development challenges are numerous and complex in nature: Over population leading to increase demand of water, land for habitation, food, health has led to encroachment on wetlands which has impacted in reduction in water quality and quantity and as a result the extinction of aquatic and ecological ecosystem is at alarming rate (MEA, 2005).

In Kenya, the concerns are high within the environmental conservers, academicians and all other stakeholders that impact of riparian community's livelihood strategies on wetlands health is high and has eaten a good portion of wetlands. As a result, rate of siltation, disruption of wetlands hydrological pattern has increased over the last decades. Consequently, these has resulted to increased droughts and floods patterns. Hence, unpredictable market conditions. In addition, there is social values degradation, low agricultural production as well as food insecurity and all these points to the impacts of livelihood activities on wetlands conservation (MEA, 2015).

Progress has been made in the formulation of environmental management policies to protect and conserve wetlands but the process of implementation and application of such policies still lags behind. Currently, there is a conflicting ongoing debate on the most acceptable strategy on how to manage a common pool resource. On the right wing are the Researchers, who argues that common pool resources belong to the community and as such, the community should be given full ownership and conservation mandate of those resources. However, this is from ideological perspective, not empirically supported by data. While on the other left wing are the academicians and practitioners who believes that wetlands are state owned properties, and their conservation is vested on the state institutions. (Ostrom, E., Jassen, A., and Anderies, M., 2007).

Empirically, there is lack of evidence showing who owns wetlands and rivers in Kenya and Murang'a County is not exceptional. One school of thought hold it that wetlands and rivers are owned by the state and therefore they should be conserved and protected by the state and this has led to massive destruction of wetlands and rivers as the society are using them with "I don't care" attitude believing that they are stealing from the government (MCDIP, 2018).

While another school of thought holds it that they are owned by the community and as a result the community should protect their property. There are numerous challenges affecting wetlands conservation and restoration in Kenya, such as lack of principle of equity, risk management, inadequate conservation information, conflicting laws and policies on riparian land ownership and the technical measures output control, all these calls for the attention of all the stakeholders (Bahir, D.2010).

Human beings depend on natural resources as sources of water, food, materials, energy and others, and some degree of degradation is caused by human economy as the natural resources are extracted to support livelihoods. The purpose of wetland conservation is to ensure that existing resources are not depleted and the damage caused to wetlands health does not exceed limits of tolerance and viability of ecosystem. There are myriad of challenges facing wetlands health and conservation, as a result, achieving the Sustainable Development Goals (SDGs) of sustained cities and communities is not as easy as we may be made to believe (Bahir, D. 2010).

Degradation of wetlands health impacts on wetlands conservation and benefits in one way or the other, and at the same time affects livelihood strategies of the concerned community. Degradation of wetland is as a result of valuing one benefit of wetland among other benefits as well as wetlands health and it refers to as the alteration of the existing or intact wetlands resulting into simplification or disruption in its structure, function, composition and loss of biodiversity and ecosystem services. Wetland degradation are human induced and causes climate change, increased drought and floods, Lakes and sea level rise. The degradation of wetlands results to loss of their benefits which also impacted negatively to human health as well as wellbeing (Sida, 2016). However, there is limited data on evidence base research done in Kenya to assess the impacts of riparian community's livelihood strategies on wetlands conservation and restoration. It is on this background that the study was conducted in Kenya and particularly among riparian communities living and drawing their livelihood on wetlands in Murang'a County.

3. METHODOLOGY

The study adopted a descriptive survey design. Leavy (2017) observes that a descriptive survey brings out facts clearly about activities and people's perception on a given problem and provides solution. The study was conducted in four purposely selected Sub-Counties of Murang'a with vast characteristics of wetlands which included; Kiharu, Kangema, Mathioya, and Maragua. The target population for the study was 144,376 riparian communities living and drawing their livelihoods from wetlands. The study also targeted 24 key informants in each Sub-County which were drawn from government sectors, CBOs, NGOs, Women groups, micro finance institutions, and local trades. The target population was divided into four strata such as Kiharu Sub-County stratum, Kangema Sub-County stratum, Mathioya Sub-County stratum, and Maragua Sub-County Sratum. Thereafter, a simple random sampling was used to obtain 404 sample respondents. Questionnaire was the main research instrument and of the 404 respondents to whom questionnaires was administered, 86.6% (n=350) answered the questions well and were eligible for the final analysis. Key Informant interviews, focus group discussion, and documentary analysis were used to corroborate responses from the questionnaires. Qualitative data were coded before the analysis. Both quantitative and qualitative data were analyzed using SPSS software. Continuous variables were analyzed using a Chi-Square test and P-values of <0.05 at 95% confidence interval level was considered significant.

4. FINDINGS

4.1 Demographic Information

Sufficient personal information of respondents was necessary to understand the kind of respondents from which primary data was collected and the basis under which the interpretations are made. The background information is important to the study because it helps the researcher to understand some issues that are important in the analysis. Among the demographic characteristics regarding the respondents include age, gender, highest level of education and the number of permanent residents of the family that ate and spend the previous night in the household. Biologically, age is a very important component of human capital in Sustainable Livelihood Approach. The study assessed the age category of the respondents and as presented in Table 1, 24.9% are in the 51-60 years age category, 24% are in 41-50 years age category, 13.7% are in the 61-70 years age category, 13.4% are in the 31-40 years age category, 11.1% are in the age category of 71-80 , 6.6% are in the age category of 25-30, 5.1% are in the age category of 18-24.

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Table 1: Age Category

	Frequency	Percentage
18-24 Years	18	5.1
25-30 Years	23	6.6
31-40 Years	47	13.4
41-50 Years	84	24
51-60 Years	87	24.9
61-70 Years	48	13.7
71-80 Years	38	11.1
Others	4	1.1
Total	**350**	**100**

Approximately 1.1% indicated others, with a mean of 4.48 and a standard deviation of 1.618. From the finding's majority of the respondents, over 87% are aged between 31 years and 80 years.

4.2 Highest Level of Education

The academic qualification of the respondents was crucial in establishing the highest level of education that the respondents had as it could give objective insight in the variables under study. The respondents' highest level of education was assessed and as indicated in Table 2, 41.2% have secondary education, 23.1% have primary education, 16.6% have diploma, 13.7% have a bachelor degree, and 2% have post graduate education, while 3.4% indicated others, with a mean of 2.41 and a standard deviation of 1.230.

Table 2: Highest Level of Education

	Frequency	Percentage
Primary	81	23.1
Secondary	144	41.2
Diploma	58	16.6
Bachelors	48	13.7
Post Graduate	7	2
Others	12	3.4
Total	**350**	**100**

The literacy level for the respondents was high at over 96% and this facilitated the collection of quality data. The findings are also consistent with a study by UNESCO (2020) in which the total percentage of the population at 15 years and above who can, with understanding, read, and write a short, simple statement on their everyday life stood at 81.53% in 2018, with the male registering 84.99% literacy and female registering 78.19% literacy.

4.3 Land Tenure and Encroachment

In Kenya, there are two types of land tenure that's freehold and leasehold. In freehold the holder is given an absolute ownership of the land for life and descendants succeeds the owner in a family lineage procedure. There is no restriction to the use of land in freehold or occupation and a title deed is issued to the owner.

In leasehold system, the interest to use the land for a period of time and under a specific period of time is gained through payment of fee or rent to the owner or governing authority. Water Act (2016) hold that riparian land is that land in which management obligations are imposed on the owner by WRA as a result of its proximity to water body. WRA also determines, demarcate, prescribe activities/conservation measures and provide information on riparian land (Constitution of Kenya, 2010). The respondents were asked if they own land they live in and the findings indicated in Table 3, shows that 92.3% indicated they own land while 7.7% indicated they do not own land. The findings were supported by that of Linnerud., K. and Holden,E. (2016) that with food consumption and demand presenting over 60 per cent of total expenditure, then access to land is crucial for poverty reduction and food security for the rural poor.

Table 3: Land Ownership

	Frequency	Percentage
Yes	323	92.3
No	27	7.7
Total	**350**	**100**

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4.4 Household Size

In the family set up, decisions such as childbearing, health care, education, labor, savings and consumption pattern primarily occur at the household level. Understanding of household size is important as it informs the basis of livelihood strategies choices of any given community. The respondents' household size was assessed and the findings presented in Table 4, indicate that households of size 1-5, have 37.1% males and females are 38.3%, household of size 6-10 have 10 % males and 11.4% females, households of size 11-15, have 1.2% males and 1.4% females, while households of size 16-20 have 0.3% males and 0.3% females. The findings imply majority (75.4%) of the household size has between one and five people.

Table 4: Household Size,

Household Size	**Male**		**Female**		**Total**	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1-5	130	37.1	134	38.3	264	75.4
6-10	35	10	40	11.4	75	21.4
11-15	4	1.2	5	1.4	9	2.6
16-20	1	0.3	1.4	0.3	2	0.6
Total	**170**	**48.6**	**180**	**51.4**	**350**	**100**

The study findings were corroborated by that conducted by United Nations Department of economics on household size composition around the world in 2017 which indicated that in the global context, average household size ranges from fewer than three persons per household to more than six while large household size has an average of five or more persons per household. This notion is further supported by Danie, M. (2016) who conducted a study on the impact of household size and poverty in South Africa, the findings indicated that there is a correlationship in the household size and poverty level as fewer children in the household level contributes to high development rate and hence a reduction in poverty at both household and macro-economic level.

4.5 Presentation of the Findings

The objective of the study was to assess the impacts of riparian community's livelihood strategies on wetlands conservation and restoration in Kenya and specifically in Murang'a County. The study first sought to assess whether wetlands were used sustainably and the findings indicated that 50.9% are of the opinion that the wetlands in Murang'a County are not used sustainably while 49.1% agree they are used sustainably. The study findings are shown in Table 5.

Table 5: Sustainable Use of Wetlands in Murang'a County

	Frequency	**Percentage**
Yes	172	49.1
No	178	50.9
Total	**350**	**100**

The study sought to determine causes of wetlands degradation. The respondents were asked to rate the causes of wetlands degradation and the findings presented in Table 6.

Table 6: Causes of Environmental Degradation, *n = 350*

Causes of Environmental Degradation (Percentage)	**Most Serious**	**Serious**	**Least Serious**
Deforestation	67.7	7.4	24.9
Overfishing	39.4	23.4	37.1
Sand Harvesting	53.4	23.7	22.9
Charcoal Burning, Firewood and Timber Harvesting	48.9	24.9	26.3
Industrial Activities	50.9	23.7	25.4
Encroachment	53.4	23.4	23.1
Over Grazing	47.1	18.3	34.6
Waste Disposal	54.9	24	21.1
Irrigation Activities	48.9	19.7	31.4

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The findings imply majority (67.7%) of the respondents are of the opinion that deforestation is the most serious cause of wetlands degradation. Trees play key roles in absorbing carbon dioxide, trapping of greenhouse gases, control of global warming. The results conform with that of World Bank (2015), that forest in the World are disappearing at alarming rate as over the past 50 years, 46% of the forest cover have been destroyed.

Wetlands degradation leads to reduction in wetlands ecosystem benefits yet the demand for wetlands services are increasing daily. The respondents were asked how they strike a balance between livelihood sustainability and conservation of wetlands and the findings presented in Table 7, shows that 36.3% apply fertilizer and manure from livestock, 27.1% plant trees and avocado, and 11.1% practice wise use of wetlands, among other livelihood sustainability and conservation of wetland practices. The findings imply majority (36.3%) apply fertilizer and manure in striking a balance between livelihood sustainability and conservation of wetlands.

Table 7: Livelihood Sustainability and Conservation of Wetlands

	Frequency	Percentage
Planting Trees and Avocado	95	27.1
Wise Use of Wetlands	39	11.1
Application of Fertilizer and Manure from Livestock	127	36.3
Capacity Building	10	2.9
Inclusive Involvement	7	2
Minimizing Irrigation Rate and Reuse of Domestic Water	2	0.6
Using Pesticides	4	1.1
Good Waste Management Practice	19	5.4
Crop Rotation	10	2.9
Use of Water Pump Machine	4	1.1
Business as Alternative Livelihood	9	2.6
None	18	5.2
Others	6	1.7
Total	**350**	**100**

The finding was further corroborated by FAO (2016), which observed that 80% agricultural farmers use fertilizers in their crop cultivation with an aim of boosting yield production. During a FGD in the study area, it was observed that due to extensive fertilizer application, soil chemistry had been interrupted and the soil could not sufficiently supply enough nutrients to the plants. Majority of the Participants indicated that before they apply fertilizers, their plants exhibit symptoms expressing lack of plant nutrients:

The study sought to determine the respondent's level of awareness on wetlands conservation programs or efforts being undertaken in their areas and the findings presented in Figure 3, shows that 70.3% are not aware of such programme while 29.7% are aware there are wetlands conservation programs. The study findings imply majority (70.3%) were not aware of any wetland's conservation programs in their areas.

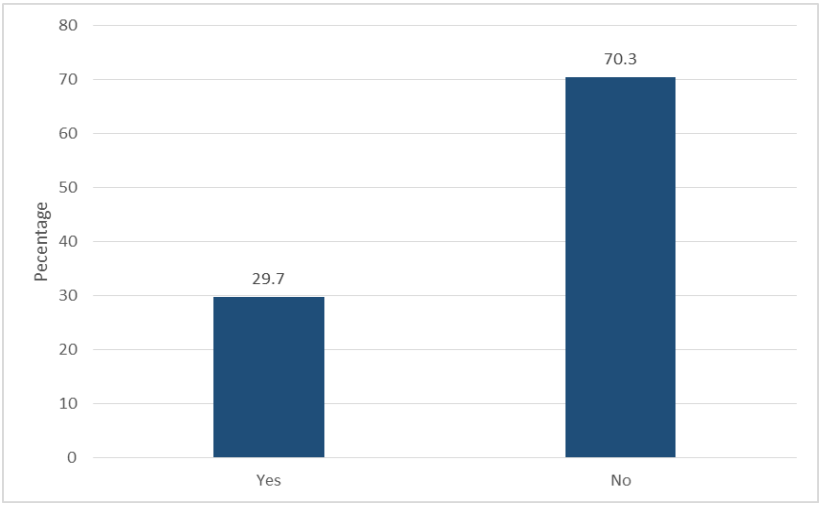

Figure 3: Wetlands Conservation Programs, *n = 350.*

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The findings were corroborated by Kenya Wetlands (2012), which observes that there is a lack of awareness on wetlands conservation and restoration programs leading to a wide vacuum on policies and legal conservation development plans, hence loss of wetlands and their biodiversity. The findings were further corroborated by key informants and focus group discussion findings which indicted that there was lack of a well-coordinated government institutional and private sector framework hence overlapping of functions

The study sought to assess some of the existing wetlands conservation Programs in area and the multiple response findings presented in Figure 4, shows that 30.6% indicated tree planting, 4% in wetlands day celebrations, 3.1% indicated media advocacy, 1.7% in wetlands cleaning, 1.4% in chief's Barraza and 2.6% indicated others. The findings imply majority (30.6%) of the respondents indicated tree planting as a predominant wetland conservation Programme in the study area.

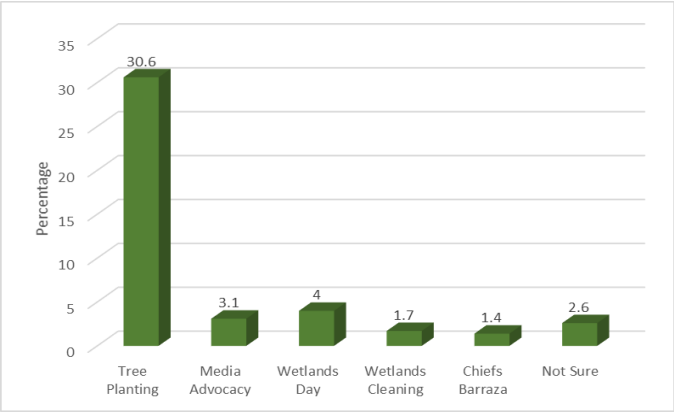

Figure 4: Types of Wetlands Conservation Programs, *n = 350.*

The study further examines the respondent's participation in wetlands conservation efforts and the findings as presented in Table 8, shows that 73.7% have not participated in any wetlands conservation efforts while 26.3% have participated. The findings imply that majority (73.7%) of the respondents have not participated in wetlands conservation efforts.

Table 8: Participation in Wetlands Conservation Efforts

	Frequency	**Percentage**
Yes	92	26.3
No	258	73.7
Total	**350**	**100**

On whether there were organizations that take care of the wetlands in Murang'a County. The study found that 57.1% indicated the County Government of Murang'a, 29.7% indicated NEMA, 7.4% indicated National Government, 4.6% indicated CBO's, 2.6% indicated KWS, 2% indicated KFS, 1.7% indicated WARMA, 1.1% indicated TARDA, and 2.3% indicated others. The study findings imply the County Government of Murang'a and NEMA have a higher stake in taking care of wetlands in Murang'a County as indicated in figure 5 below.

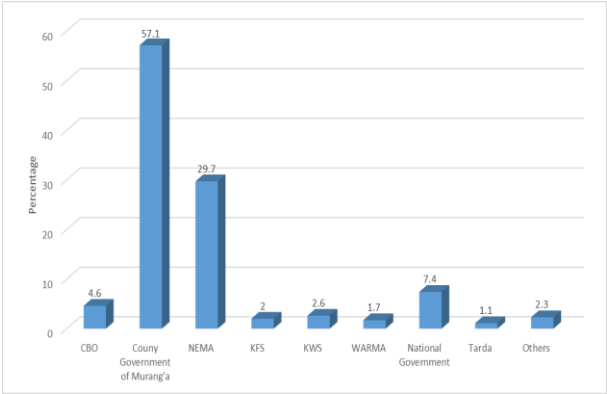

Figure 5: Organizations taking Care of Wetlands in Muranga County, *n = 350.*

The findings were further corroborated by Murang'a County Integrated Development Plan (2018-2022), which observes the contribution of wetlands to its economy and acknowledge the benefits of organized community groupings funded through WARUAs, FUAs, and other like-minded organizations in wetlands conservations.

On the measures that can be implemented by the government and private sector that can improve wetlands conservation and restoration in Murang'a County, the findings presented in Table 9, shows that 20% suggest capacity building, 12.9% suggest provision of alternative livelihood strategy, 9.1% suggest creation of job opportunities, 7.7% improvement in infrastructure, 7.1% suggest investing in irrigation schemes, while 6.9% suggest wise use of wetlands training among others.

Table 9: Improving Wetlands Conservation and Restoration, *n = 350*

	Frequency	Percentage
Provision of Alternative Livelihood Strategy	45	12.9
Enhanced Financial Assistance e.g. Loans	7	2
Capacity Building	70	20
Gender Equality	14	4
Wise Use of Wetlands Training	24	6.9
Road Construction and Improved Drainage	2	0.6
Provide Modern Equipment for Farming	7	2
Improved Drainage System	17	4.9
Youth Training	17	4.9
Media Advocacy for Wetlands Conservation	9	2.6
Creation of Job Opportunities	32	9.1
Investing in Irrigation Schemes	25	7.1
Allocation of more Resources to Institutions Charged with Wetlands Conservation Measures	9	2.6
Improved Payment of Cash Crops	15	4.3
Improve Infrastructure	27	7.7
Provision of Markets to Farm Produce	17	4.9
Value Addition to Farm Produce	11	3.1
Others	2	0.6
Total	**350**	**100**

5. DISCUSSIONS

The findings show that 50% of the respondents were for the opinion that wetlands in Murang'a County are not used sustainably. The findings are consistent with Kenya Wetlands Atlas (2012) which observes that overexploitation of wetlands benefits is key driver to wetlands degradation.

The study findings indicated that 67.7% of the respondents had the opinion that deforestation is the most serious cause of wetlands degradation. The findings are consistent with World Bank (2015) that forest cover in the Word are disappearing at alarming rate as over the past 50 years, 46% of the forest cover have been destroyed as a result of increased human activities. Key Informants were also in agreement that trees play a key role in absorbing carbon dioxide, trapping of greenhouse gases, control of global warming and as a result, deforestation is causing climate change with huge consequences in the area.

On striking a balance between livelihood sustainability and wetlands conservation and restoration. The study found that 36.3% apply fertilizers and manures from livestock, 27% plant trees and avocado among others. In support of the findings, FAO (2016) reported that 80% of agricultural farmers use fertilizers in crop cultivation with an aim of boosting crop yield production. In contrast of the findings, Focus Group Discussion revealed that extensive application of fertilizer has led to soil chemistry interruption, hence the soil could not sufficiently supply enough nutrients to plants.

On the respondent's level of awareness on wetlands conservation and restoration programs or efforts being undertaken in the area, the study found that 70.3% of the respondents were not aware of such programs. In support of the findings, Kenya Wetlands Atlas (2012) reported lack of awareness on wetlands conservation and restoration programs leading to a vacuum on policies and legal conservation development plans. Hence, loss of wetlands and their biodiversity. Key

Informants and Focus Group Discussion were in agreement with the findings that there was lack of a well-coordinated government and private public participation leading to overlapping of wetlands conservation and restoration efforts.

The study sought to assess the existing wetlands conservation programs or efforts. The study found that tree planting (30.6%) is the predominant wetlands conservation program or effort in the study area. In support of the findings, Ekhuemelo (2016) who conducted a study in Nigeria on the importance of water supply and rainfall, reported that 90% of the tree buffer plays key role in environmental conservation. Hence, cutting them, degrades the environment. Key Informants and Focus Group Discussion were in agreement with the findings that the County Government of Murang'a has initiated a strategy to increase the forest cover as well as enhancing alternative livelihood strategies by distributing avocado seedlings to riparian communities. The strategy is a response to the alarming rate of deforestation in the area. They applaud the effort of avocado seedlings distribution to the riparian communities as a way of killing two birds using one stone.

As much as the County Government of Murang'a has initiated avocado planting strategy in the area, the study findings indicated that 73.7% of the respondents have not participated in any wetlands conservation efforts. Key Informants and FGD were in agreement with the findings as they indicated that wetlands conservation and restoration in Murang'a County, is a top down approach and lacks community's participation. Hence, not all inclusive.

The study sought to assess organizations that were taking care of wetlands in Murang'a County. The study found that (57.1%) County Government, (29.7%) NEMA, (7.4%) National Government, (4.6%) CBOs, (2.6%) KWS, (2%) KFS, (1.7%) WARMA, (1.1%) TARDA and (2.3%) Others. In support of the findings, Murang'a County Integrated Plan (2018-2022), acknowledges the benefits contribution of wetlands to its economy and allocated some funds in its financial budget to assist in wetlands conservation and restoration.

The study sought to determine measures that can be implemented by the government and private sectors to improve and enhance wetlands conservation and restoration. The study found that 20% suggest capacity building, 12.9% suggest provision of alternative livelihood strategy, 9.1% suggest creation of job opportunities, 7.7% improvement in infrastructure, 7.1% suggest investing in irrigation schemes, while 6.9% suggest wise use of wetlands training among others that can be implemented by the National Government, the County Government of Murang'a and the private sector to improve on the wetlands conservation and restoration measures in Murang'a County.

6. CONCLUSIONS AND RECOMMENDATION

The study concluded that riparian's livelihood strategies in Murang'a County has a negative impact on wetlands. Uncontrolled riparian livelihood strategies, led to over exploitation of natural resources as well as over use of wetlands. In this regard, there were challenges ranging from lack of knowledge about wise use of wetlands to conflict of interest among different environmental conservation institutions. Thus, impacting negatively on wetlands conservation in Murang'a County. In addition, balancing food insecurity and environmental conservation and restoration is a contemporary global topic of discussion. Hence, the study recommends an improved natural resource information system maintained by national and county governments, management of water and other natural resource use, balancing ecological and livelihood sustainability, well coordination and cooperation of all stakeholders for effective wetlands and natural resource conservation and restoration.

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