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Examing the Impact of Land Use Change on Wetland in Kenema City

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Abstract

Wetland, a natural ecosystem that has not been tampered with, plays a pivotal role in the effective and efficient functioning of the ecosystem by acting as a regulator and major source of water. During flood disasters, it serves as a regulator and reservoir for flood waters. In urban settlements, land use patterns are changing drastically and as a result, wetlands are deteriorating at an alarming rate in West Africa; particularly Kenema in Eastern Sierra Leone. This article examines land use changes and its impact on wetland in Kenema City, Eastern Sierra Leone. The study communities were purposefully selected because they had all the variables needed for the completion of the study. The study used the case study design as it looked at a single case (impact of land use change on wetland in Kenema City). Data collection methods used were questioning, observation, socio-economic and ecological survey and questionnaire. A qualitative technique was used to analyze the findings. Findings reveal that households in the study communities were large with low income earning from agriculture that was seasonal. Factors of land use change in the selected wetland communities ranges from agriculture to construction of settlements. Land use activities on wetlands include agriculture, grazing, construction of settlements and roads etc. The impacts of the activities on wetlands range from land use conflict to destruction of water storage potentials. It was therefore recommended that communities, land owners and environmental MDAs work in collaboration in making sure that wetland protection laws are abided by for the benefit of the city and by extension the Country.

Key words: Wetland, Chinese Farm, Kakajama, Buwaihun, Plant and animal species, extinction and water storage potentials.

INTRODUCTION

The United Nations Convention to combat Desertification (UNCCD) defines land as “the terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system” (Article 1 of the Convention). Land use refers to the management or modification of the earth's land surface by human agents which often take cognizance of the conversion of natural landscapes like forests or wetlands into built environments or agricultural production, but also includes activities such as mining or the storage of waste into landfills. Wetlands are one of the crucial natural resources used by man

since time in memorial. Over the past decades, this finite resource has undergone pressure from man's usage and most areas have been degraded. It is increasingly realized that planet earth is facing grave environmental problems which are fast depleting natural resources and threatening the very existence of most of the ecosystems. About 4,837.8 Sq. km of the surface area of Sierra Leone is covered by wetlands with vegetation that is typically of freshwater swamp forests, riparian and mangroves (Blinker 2006). Fresh water Ecosystems consist of swamps, rivers, other waterways and canals. Bah (1994) identified and mapped out sixty-six (66) wetland areas in Sierra Leone. A good number of the wetlands are found in rural communities in the form of fresh water swamps. Kenema City is located on vast inland valley swamps and basins of the Lambayea and Kainja Streams. Wetland ecosystems in Sierra Leone have undergone threats from land use practices due to the fact that policies and acts on their protection were established quite recently such as the National Area Authority Trust Fund Act 2012 and Sierra Leone Convention on Biodiversity (2020). The country became the 118th contracting party of Ramsar Convention in 2000. Ramsar convention is the world's intergovernmental treaty on conservation and use of resources therein. It was established in 1971 but came into full operation in 1975 and it defined wetland as areas of marsh, fen, peat or water, whether natural or artificial, permanent or temporary, with water that is static or flowing fresh, brackish or salt, including areas of marine waters at the depth of low tide that does not exceed six (6) meters. The convention makes other provisions that include other landscapes to be classified as wetland such as riparian and coastal zones adjacent to the wetlands and islands or bodies of marine water deeper than six (6) meters at low tide lying within the wetlands (Article 2.1). The wetlands in Kenema City fall under mash, swamps and inland valleys based on the definition and classification of the convention. According to Wu and Wu (2013), land use change is a fundamental spatial process resulting from the collective outcome of a myriad of socio-economic, institutional, biophysical and ecological processes. Land use change in Sierra Leone, particularly Kenema is driven by human activities of various sorts that affect agricultural production. This is justified in the work of Pop et al. (2014) who postulated that land use change in any given community is driven by human activity that has the potential to greatly affect food security and agricultural sustainability coupled with forest product supply. For any development to take effect, land use processes play pivotal roles such as building human settlements, recreational facilities, establishment of industries and factories and more importantly agricultural practices. According to Galbraith et al. (2005), wetlands are gaining recognition because of their unique contribution to aquatic ecosystems. Therefore, they have been classified and protected according to Ramsar Convention of 1971 (articles 1.1 and 2.1). Advantageously, Sierra Leone became a signatory to the Ramsar Convention in 2000 and have over the years enacted legislations to protect wetland from further depletion such as the Wildlife Conservation Act of 1972, The Forestry Act of 1988, National Protected Area Authority and Conservation Trust Fund Act (Act 11 of 2012), Sierra Leone Convention on Biological Diversity (2020) from which the Act of Wetland Conservation was drafted, Sierra Leone Convention and Wildlife Policy 2010, and the Minamata Convention-Environmental Protection Agency act (Act 24 of 2008) amended in 2010. Currently, Sierra Leone has one site designated as Wetland of international importance (Ramsar site) with a surface area of 295, 000 hectares which is the Sierra Leone River Estuary. In Sierra Leone, particularly in Kenema City any development activity undertaken on land requires a permit and or authorization from duty bearers through the various Acts and Policies regarding its usage. Over the years however, urban land use pattern has shifted from this norm to various forms such as land grabbing, conflict over land ownership leading to loss of lives and lack of full

implementation of the various acts and policies on land usage. To avoid this anomaly, William and Riebsama (1993) opine that land users and state policies and regulations must agree first before environmental authorization or record of decision is issued out. In urban communities (cities) in Sierra Leone particularly Kenema City, access to land is key to the type of land use patterns envisaged in communities. Lands in the Central Business District (CBD) and Reserves are expensive and protected but local authorities and land owners sell the land-to-land users which are utilized for building, agriculture and for other purposes. Land that is highly accessible has high economic value because it satisfies needs such as space for housing and other land uses, and there is always intense competition for such locations (Hasen et al. 2017). Although unhealthy competition for land use may lead to conflicts, healthy ones between potential users can create a pattern of land use in that area (Mather, 1994). Wetlands are very important to humans as they serve as livelihood assets and above all protection. This all-important resource is not appreciated by man. In Kenema City, land use practices particularly on wetlands are depleting the ecosystem at a faster rate leading to loss of various species and original nature of landscape. These uncontrolled human activities and or land use practices may lead to the extinction of wetlands in the City. A typical example is seen in the fertile agricultural wetland communities of Lambayama (Chinese Farm), Kpetema leading to Wahn Man Abu Road, Buwaihun 1&2 and Dama Road leading to Kissy Town where bulk of the wetland areas have been used for buildings for various purposes and other unfriendly environmental agricultural activities. The land use practice does not only drain the wetland but may lead to its extinction in the near future. Wetland degradation in Kenema City is also caused by the growing population and the immediate environment that is accessible and cheap to accommodate the poor city dwellers is the wetland. It is reclaimed and used for housing without documentation or legal ownership right from land owners, City council, Ministry of Lands and above all no environmental advice or knowledge seek. Most of the areas are prone to annual flooding and the settlements are mainly slums occupied by urban poor and criminals. It is against this backdrop that the study sought to examine the impact of land use on wetlands in Kenema City, Eastern Sierra Leone. Therefore, the objectives included examining various land use practices on wetlands and its impact on land use change in the city.

2.1 METHOD AND MATERIALS

MAIN CHARACTERISTICS OF THE STUDY AREA

Kenema City is found in Eastern Sierra Leone. It is the regional headquarters found in the Nongowa chiefdom. It is situated at the foot of the Kabul Hills North. It lies between latitude**: 7° 52' 59.99" N and longitude: -11° 10' 60.00" W**. In Kenema, the wet season is warm, oppressive and overcast while the dry season is hot, muggy, and partly cloudy. Over the course of the year, the temperature typically varies from 66°F to 93°F and is rarely below 60°F or above 99°F. The average temperature of the year in Kenema is 78.8°F (26°C). The warmest month, on average, is March with an average temperature of 81.5°F (27.5°C). The coolest month on average is January, with an average temperature of 77.0°F (25°C). The average amount of precipitation for the year in Kenema is 104.9" (2664.5 mm). The Month with the most precipitation on average is August with 17.3" (439.4 mm) of precipitation and the Month with the least precipitation on average is January with an average of 0.5" (12.7 mm). In terms of soil, the soil type in the city is largely loamy with some pockets of sandstones and clay. The loamy soil is rich in organic matter and highly permeable. It therefore supports different types of

vegetation in community land uses. Wetlands in the study area are scattered and two main remarkable areas include Chinese Farm and Kakajama wetland that is spread along the Lambayea Stream and the Buwaihun one (1) and two (2) wetlands starting from the foot of the Kambui Hills North to the main Kenema –Kailahun highway. The land use patterns in the study area are different such as human settlement, agriculture etc. The major characteristics of the study area is that it's a home of different vegetation types and animal species

SOCIO-ECONOMIC SURVEY

One major method used to collect data from the field was interview and the tool was interview schedule which was used to collect data from officers in the Ministry of Environment, Ministry of Land and Country Planning, Environmental Protection Agency (EPA), and the Kenema City Council. Fifteen (15) participants were randomly selected from the MDAs listed above in the following order; three (3) from Ministry of Environment, five (5) from Ministry of Land and Country Planning, three (3) from EPA and four (4) from Kenema City Council. All the MDAs mentioned have offices and workers in the city who by policy are responsible for the management and protection of wetlands. Residents in the wetland environments (study communities) were also interviewed. All interviews were centred around impacts of land use change on wetland in Kenema City. Apart from the interview, questionnaires were also used to collect data from the field. All households on Kenema City Council list presented for the selected communities were checked and reviewed eliminating those who were not found and replaced by those found in the study communities. A total of one hundred and forty (140) participants from the households were selected. This was done by numbering all households on the updated list in the study communities on a piece of paper, folded and put in a sack. It was thoroughly mixed and participants were asked to select one folded paper from the sack. Those with writings on their ballots were selected and enlisted as participants and those who selected empty riffle were dropped. This was done until all the one hundred and forty (140) participants were randomly selected. These formed the basis of the distribution of the questionnaires in the selected study communities. The total number of participants was one hundred and fifty-five (155) which included those who responded to the interviews and questionnaires. The questionnaires were pretested and corrections made where applicable and finally distributed to participants. The questionnaires were divided into two sections; socio-economic characteristics of participants dwelling in the selected communities and participants view on the impacts of land use on wetland in their communities. The questionnaires were collected within a week and collated for analysis. Interview venues were selected by the participants as well as the time. All their responses were read in their hearings, accepted and collated for analysis.

ECOLOGICAL SURVEY

An ecological survey is a process that assesses a proposed development site to determine any potential environmental impacts that may arise from the development. Such surveys are undertaken for a variety of reasons but for this study, it was carried out to determine the potential constraints land use change has on wetlands in Kenema City. The study communities were visited severally to assess the existing situation. During the survey, data was collected on major land use changes on wetlands in two large wetland areas (Lambayama/Chinese Farm extending to Kakajama and Buwaihun 1 and 2 stretching to the Kailahun-Kenema Highway). Remarkable

photographs of the areas of interest showing different land use practices were taken. Similarly, main land use activities carried out in the area were also identified and captured not neglecting observance of the wetland condition.

RESULTS AND DISCUSSIONS

SOCIO-ECONOMIC CHARACTERISTICS OF PEOPLE ENGAGED IN LAND USE ACTIVITIES ON WETANDS IN KENEMA CITY.

Land users in the municipality of Kenema comprise different classes of people from different socio-economic backgrounds; but as they settle down in the City to carry out their land use activities, they all exhibit common characteristics.

TABLE 1: HOUSEHOLD FAMILY SIZE

NUMBER OF PERSONS PER HOUSEHOLD	NUMBER OF RESPONDENTS	PERCENTAGE
1-3	20	14
4-6	35	25
7-10	60	43
11+	25	18
TOTAL	140	100

SOURCE: Field Data, 2021.

Studies in the selected communities in the Municipality of Kenema show that the bulk of the households had 7-10 people and they all ate from the same pot which characterized them as a family unit. Similarly, a large number of households also had 4-6 people and 11 and more people who were all involved in land use activities in the study communities. Even households with 1-3 people claimed that they were equally involved in land use activities on wetlands. This is contrary to the study of Ranaga and Gumbo (2015) who postulated that large size families were the norm in rural communities of South Africa. This was due to the fact that as family members get older, they seek virgin land for their own settlement alongside their subsistence agricultural practices which exert pressure on the available land. The situation is not only akin to rural communities but also cities as it is evident in Kenema City. As family sizes increase, there is pressure on wetlands for new settlements and agricultural activities which are not readily available and therefore they embark on reclaiming wetlands for settlements with their vulnerable family members. Large size families in Kenema City are exerting more pressure on the few available plots of land and more importantly wetlands which they illegally utilize for their

livelihoods and socio-economic wellbeing. This has contributed greatly to land use change in the city and the impact on wetland ranges from lose of valuable species (both plants and animals).

FIGURE ONE: MONTHLY INCOME OF RESPONDENTS

MONTHLY INCOME (Le)	NUMBER OF RESPONDENTS	PERCENTAGE
LE 250,000	120	86
LE 250,000-500,000	15	11
Above LE 500,000	5	4
TOTAL	140	100

SOURCE: Field Data, 2021.

Data provided for Currency and Coinbase for Cryptocurrency, (n.d).

US$1=10, 250.00 Leones.

Figure one describes the monthly income of respondents in the selected study communities. 86% of the respondents stated that their monthly income was Le 250,000 which is equivalent to $24.39 United States Dollars, 11% indicated Le 250,000-500,000 which is equivalent to $ 24.39-48.79 and 4% claimed that their monthly income was above Le 500,000 which is above $48.79 respectively. Discussion reveals that respondents who earned above Le 500,000 which is equivalent to $48.79 were employed by government, NGO or were entrepreneurs but were also involved in land use activities near or on wetlands in the study communities. The bulk of the respondents earned below Le 500, 000 ($48.79) and were directly involved in land use activities and had large size families. Most Sierra Leoneans live on less than $1 dollar per day which is not up to Le 10,250.00. It was also discovered that bulk of the respondents in the study communities earned less than Le 500,000 ($48.79) per month even though government has passed into law the Minimum Wage Bill (Sierra Leone Labour Law, 2021) which stipulates that an average monthly worker in Sierra Leone should not be paid less than Le 500,000 ($48.78) per month. In such situations, poverty is the result. This is also supported by Sierra Leone's Finance Act (2021). Poverty forces people to practice subsistence agriculture and to reclaim wetlands for such practices and more importantly to build settlements such as slums, and shanty communities. This is in line with work of Lambin et al (2001) who opines that poverty is a major factor that forces people to engage in subsistence farming. Apart from subsistence farming, respondents indicated that they were also forced to excessively exploit the wetlands of various resources such as fish, raffia etc. so as to raise income to support their families.

MAIN FACTORS OF LAND USE CHANGE IN KENEMA CITY.

Respondents were asked to identify the main factors that contribute to land use change in their communities. Among the factors identified were increase in population, agricultural activities which were mainly subsistence, poverty, grazing, and traditional herbs (medicine). Increase in population was one of the leading factors that contributes to land use change in the study communities. As the population grows, the demand for land for settlements, agricultural activities and trade increases. The City of Kenema is growing at an alarming rate and therefore wetlands are reclaimed for settlement, and above all agricultural activities. According to Population and Housing Census (2004 and 2015), the population of Kenema City was 128, 402 and 200, 443 respectively. There was an increase of 72,041 people within (10) ten years. This had implications for land use change in the city. The current increase in population in the city causes land use change as people entering the city for settlement seek new land to construct houses and undertake agricultural activities. This is in line with the work of Naibbi et al. (2014) who postulated that population increase adds pressure on human settlements. To relieve dry lands from such pressure Tian et al. (2015) suggested that the availability of wetlands is one way in which pressure on existing dry lands in the city can be relieved. This justifies the action of land users in the study communities to reclaim wetlands devoid of the consequences on the habitat. During discussions with the Ministry of Lands, Ministry of Environment and EPA staff, it was very clear that population increase has been an issue very difficult to control in relation to land ownership and use in Kenema City. Wetlands by policy should not sold, but traditional rulers and land owners sell them without the knowledge of the ministries. Besides, land grabbing is very eminent in the locality.

MAIN LAND USE ACTIVITIES IN AND AROUND WETLANDS IN KENEMA CITY.

During ecological survey, the main land use activities in and around wetlands in the city were identified in the selected study communities. Prominent among the land use activities were cultivation of various crops, grazing, construction of settlements, and roads. Agricultural production was key among land use activities in and around wetlands in Kenema City with rice being the predominant crop cultivated in both the wet and dry seasons due to the availability of water particularly in Chinese farm/Lambayama and Kakajama sections. The Buwaihun 1 and 2 communities cultivate in the rains. An irrigation canal of 11.40metres was constructed by the then Chinese Agro-rice development programme and also swamps at Lambayama/Kakajama known as the Chinese Farm in 1964. The first demonstration site of seven (7) acres was established but some areas of the canal has been damaged due to land use change. A vast area of the wetlands in the study communities has been destroyed by agricultural activities which is not only detrimental to plant and animal species in both the terrestrial and aquatic habitats. This is in support of the work done by Goudie (2005) which stated that wetlands are destroyed for agricultural purposes which cause pollution by either producing sediments or by generating chemical wastes which tend to regulate the growth of aquatic wetland plants. As land users clear wetlands in the study communities during cultivation, the natural vegetation cover is destroyed making the land bare to various agents of erosion. This is serious in the Buwaihun 1 and 2 wetland area where water gushes out from the Kambui hills and the hilly communities of Kordebortihun making the area often flooded in the rains destroying crops, livestock and property. The area has high erosion potentials making the water polluted. The use of fertilizers and pesticides also adds to the pollution of the soil and above all decreases the fertility of the

land in the near future. To this, Low & Rebelo (1996) on the vegetation map of South Africa and its interpretation postulated that farmers adding fertilizers and pesticides further reduce the effectiveness of the wetland in purifying water. The amount of organic matter in the soil may also be increased. Wetlands in the study communities are sources of water and food to domestic animals more especially in the wet season. Sheep and goats are raised on wetlands in specific areas though at low level. They are raised by households that have permanent settlements on the lands. This of course has impact on the vegetation as it is grazed, the land becomes bare exposing it to soil erosion and the resultant effect of soil infertility. Settlements are constructed in and around wetlands in the study communities due to population increase. Most of the settlements are slums prone to flooding every year. People permanently construct dwelling houses in this area because they cannot pay to leave in a residential area of the city. The wetlands are reclaimed by means of land grabbing or by being sold by land owners or chiefs even though they are regarded as protected areas by Ministry of Lands and the Environment. This is evident in Buwaihun 1 and 2 communities. During discussions, it was revealed that the Ministry of Lands and the Environment often marks the structures as "unauthorized" which should be demolished but are drawn aback by the lack of political will. Therefore, wetlands in the study communities continue to disappear. Similar situations exist at Chinese Farm and Lambayama/Kakajama wetlands where settlements are constructed; the worst case in point being the contract farming sites established in 1964-65 of sixty-five (65) acres along Wahn Man Abu Road adjacent to the demonstration plots which have been reclaimed for settlements. During ecological survey, it was discovered that some of the settlements were for business purposes and the EPA has issued letters to stop them but moving at a snail pace due to political interference and communal ownership system practised in the study communities as stated by EPA and City Council staff. A large area of wetlands in the study communities is also used for paths and roads due to lack of streets to link the adjacent communities as seen in the paths and roads linking Kordebortihun and Buwaihun 1 and 2 communities. Bridges are also constructed in wetlands linking other communities.

IMPACT OF LAND USE CHANGE ON WETLANDS IN KENEMA CITY

TABLE THREE: IMPACT OF LAND CHANGE ON WETLANDS IN KENEMA CITY

IMPACT	NO OF RESPONDENTS	PERCENTAGE
Land use conflict	25	17
Environmental pollution	30	21
Loss of wetland habitat	55	39
Loss of biodiversity	10	7
High erosion potential	15	10

Destruction of water storage potentials	5	6
Total	140	100

SOURCE: Field Data, 2021.

Ecological survey and discussions with respondents and stakeholders provided a clear picture of the impact of land use change on wetlands in the selected study communities in Kenema City. According to table III, 39% of the respondents stated that one main impact of land use change in the study communities was loss of wetland habitat while 21% indicated environmental pollution. From an ecological survey carried out, it was evident that a large portion of wetlands has been reclaimed for settlement and agricultural activities which is harmful in the near future. If the encroachment on wetlands continues in the study communities particularly Chinese Farm/Kakajama communities, they will disappear leading to an imbalance. When wetlands that filter the environment go in to extinction, environmental hazards such as pollution and many others are caused. As population increases in the study communities, the demand for land also increases leading to different land use activities. The land use change has been attributed to several environmental problems ranging from pollution (air and water) to loss of wildlife habitat. Discussions with EPA and City Council staff revealed that water borne diseases have been common in the study communities as the runoff contains numerous sediments and toxic contaminants which cause water pollution. This leads to the spread of typhoid and diarrhea. In the same vein 17% of the respondents stated land conflict, 10% high erosion potential and 7% loss of biodiversity as impacts of land use change on wetlands in the study communities. Land conflict occurs when there are conflicting views on land use policies such as in a situation where population increase creates competitive demands for the use of land, or communal land ownership system conflicting with state laws on land acquisition and use etc. During the ecological survey, it was discovered that a good number of settlements on wetlands in the study communities were in conflict with the law (Ministry of Lands and Environment and City Council) as the inhabitants reclaimed the plots of land without legal permission. Accusing fingers were also pointed at Local chiefs and land owners who gave wetlands to the respondents for agricultural purposes rather than building settlements. But it was discovered that some illegal financial transactions ensued between the local chiefs/land owners and the occupants. Discussions with Country Planning and EPA Officials reveal that they have issued warning letters to affected communities to stop the encroachment but did not enforce it due to lack of political will and collaboration between them and the local chiefs/landowners in the study communities. Even the agricultural activities carried out in the communities were meant to reclaim the wetland, but labour was a problem. Therefore, respondents depended on the labour of nonagricultural land users. This forced them to pay more for labour from their meagre resources which also increased their poverty status. This is in line with the work of Lynch and Carpenter (2003) who opined that as urbanization intensifies, agricultural and nonagricultural land use conflict becomes more prominent and severe. This may lead to local ordinance design where in farmers are left with no option but to pay for some of the negative impacts generated by agriculture. In such situations, farmers have to pay more for inputs or spend more time to obtain equipment repairs. The Buwaihun wetland community is situated at the foot of the Kambui Hills North and the forest has undergone severe deforestation leaving the land barely exposed to

erosion. Settlements constructed on wetlands in these communities envisage flooding regularly. Natural vegetation in wetlands cover the soil against erosion which cannot be proportionally done by plant cover. In essence, removing the natural vegetation in wetlands means the soil is exposed to potential erosion in the wetland and its control may be difficult resulting into flash floods. This has been a serious case for Buwaihun 1& 2 communities in the Kenema City as every year flooding is experienced in the rains. During such floods, fertilizers and or pesticides used are leached into the streams making wetlands ineffective in purifying water for use by the communities. This is supported by the work of Low & Rebelo (1996) who stated that during flooding on agricultural lands, the amount of organic matter in the soil may decrease considerably. This may lead to poor yields and hence a recipe for poverty. Land use pattern has also led to destruction of habitats of different species which to a large extent causes decline in wetland biodiversity potentials in the study communities. As settlements are constructed on wetlands and the adjacent landscape, some important plant and animal species are destroyed leading to their total extinction. Notably, the Sierra Leone River Estuary has been designated as a Ramsar site but currently has no legal protection. The designated site has not received any benefit from external support although the government of Sierra Leone through its Environmental Agency is doing all it could to conserve and protect these all-important wetlands. In the provinces particularly Kenema City, wetlands are reclaimed as urban population increases with different land use change which is detrimental to wetland ecosystem. With this appalling situation, there is an urgent need to establish effective legal, monitoring and prosecution systems for sustainable conservation and management of wetland ecosystems in Kenema City and by extension Sierra Leone.

CONCLUSION

Wetlands provide benefits for animals, plants and above all protect the environment. It provides food and habitat for fish and wildlife, improves water quality, store flood waters, and above all serve as aesthetic and recreation centres. With all these importance, there are a number of unsustainable land use activities carried out on wetlands in Kenema city which have negative impacts on the city.

There are laws, policies and regulations on the protection of wetlands in the City but due to population increase and the demand for land, the laws are not adhered to. As a result, large portions of wetlands have been reclaimed for settlements, road construction and unfriendly agricultural activities. These have negative implications on the wetlands in the city. It is therefore prudent that wetlands in the city be protected by local communities, land owners, Environmental Ministries, Departments and Agencies and partners by implementing environmental laws without fear or favour so that the so important wetland ecosystems are protected.

RECOMMENDATIONS

Environmental Education should be undertaken by duty bearers on the importance and use of wetlands in the city particularly in communities dwelling in and around wetlands. This strategy can help reduce the problem of land use change and wetland degradation. This is because people have to be aware of the benefits wetlands provide for them, animals and plants. Environmental education groups should be established in schools such as nature clubs and also environmental friendly clubs at work places to disseminate environmental management and protection messages in community meetings, and or through radio programmes. The Ministry of Environment,

Departments and Agencies in collaboration with local authorities and land owners should work together in making sure that wetlands be given due management and protection it deserves through monitoring and law enforcements. Fencing of wetlands that are close to extinction is also one of the essential management and protection strategies that can be adopted in Kenema city so that this all important resource will not be destroyed. This will allow wetland vegetation animal species and water storage capacity be kept undisturbed for the good of the community.

REFERENCES

Average weather in Kenema, Sierra Leone-Year Round. Also available @ **https://weatherspark.com.** Retrieved on 25th June, 2021.

Bah, O.M., (1994). The Wetlands of Sierra Leone. Workshop. Sierra Leone Conservation Society, Freetown 8-15 Oct. 1994

Blinker Leslie, (2006). Country Environment Profile (CEP) Sierra Leone.

Coinbase for Cryptocurrency, (n.d). Also available @ https://Coinbase.com. Retrieved on 25th June, 2021.

Goudie A., (2005). The human impact on the natural environment, Blackwell, Oxford.

Hasan S., Wang X., Khoo Y.B. & Foliente G., (2017). Accessibility and socio-economic development of human settlements

Kotze D.C., Breen C.M. & Klug J.R., (2000). A wetland management decision support system for South Africa freshwater palustrine wetland.

Lambin E.F., Turner B.L., Geist H.J., Agbola S.B., Angelsen A., Bruce J.W. et al., (2001). The causes of land-use and land-cover change: Moving beyond the myths, Global Environmental Change.

Low A.B. & Rebelo A.G. (eds), (1996). Vegetation map of South Africa: Lesotho and Swaziland, Department of Environmental Affairs & Tourism, Pretoria.

Mather A.S., (1994). Land use, Longman Group, New York.

National Protected Area Authority and Conservation Trust Fund Act (2012) of Sierra Leone (Act 11 of 2012).

Naibbi A., Baily B., Healey R.G. & Collier P., (2014). Changing vegetation patterns in Yobe State Nigeria: An analysis of the rates of change, potential causes and the implications for sustainable resource management.

Popp J., Lakner Z., Harangi-Rákos M. & Fári M., (2014). The effect of bioenergy expansion: Food, energy, and environment. Renewable and Sustainable Energy Reviews.

Rananga H.T. & Gumbo J.R., (2015). Willingness to pay for water services in two communities of Mutale Local Municipality, South Africa.

Ramsar convention (1975). Convention on protection of wetlands. Article 1.1.

Ramsar convention (1975). Convention on protection of wetlands. Article 2.1

Statistics Sierra Leone Population and Housing Census 2004. Also available @ https://sierraleone.unfpa.com. Retrieved on 25th June, 2021.

Statistics Sierra Leone Population and Housing Census 2015. Also available @ https://sierraleone.unfpa.com. Retrieved on 24th June, 2021.

Sierra Leone: Employment, Labour Laws and Regulations 2021

Sierra Leones: Finance Act of 2021, section 8 of the Payroll Tax Act of 1972 as amended.

Sierra Leone Convention on Biological Diversity (2020)

Sierra Leone Convention and Wildlife Policy 2010.

The Forestry Act of Sierra Leone (1988)

The Minamata Convention-Environmental Protection Agency Act (2008) of Sierra Leone (Act 24 of 2008) amended in 2010.

Tian B., Zhou Y.X., Thom R.M., Diefender H.L. & Yuan Q., (2015). Detecting wetland changes in Shanghai, China using FORMOSAT and Landsat TM imagery.

UNCCD (1994) definition of land. Article 1 of the convention.

Wildlife Conservation Act of Sierra Leone (1972)

William P. & Riebsama W (1993). Land, food and rural development in North Africa, West View Press, San Francisco, CA.

Wu J. & Wu T., (2013). Ecological resilience as a foundation for urban design and sustainability in Pickett S.T.A., Cadenasso M.L. & McGrath B. (eds.), Resilience in ecology and urban design.