Effects of the Ihefu Wetlands Ecosystem on Livelihood of Local Communities in Mbarali District, Mbeya Region, Tanzania

Emmanuel Patroba Mhache
Department of Geography, Tourism and Hospitality Studies
The Open University of Tanzania
ngororamhache@gmail.com; emmanuel.mhache@out.ac.tz
https://orcid.org/0000-0002-5580-5696

Abstract
This study examines the effects of Ihefu Wetlands ecosystem on livelihood of local communities in Mbarali District, Mbeya Region, Tanzania. Wetlands are vital life-support ecosystems, providing water year-round and fertile land for farming and grazing. The research addressed two objectives: challenges facing Ihefu Wetlands and their importance in supporting livelihoods of local communities. A mixed-methods approach was used, combining qualitative and quantitative techniques where an exploratory descriptive design was adopted. Sampling techniques used in this paper was purposive and simple random sampling. Data were collected from 150 respondents through questionnaires, interviews, and observations, while 31 journal articles were reviewed for documentary analysis. Statistical software used in this study was SPSS version 25 where data were analysed using Chi-square test, percentages, frequencies and narratives. Findings revealed that 74.7% of respondents identified wetlands as the primary source of water, 65.3% considered wetlands as wildlife habitats, while 65% identified agricultural encroachment as the major threat. However, unsustainable farming and overgrazing threaten their integrity. The study emphasises raising awareness, enforcing laws, and involving local communities in conservation efforts. Recommendations include reducing livestock numbers, controlling grazing, and penalising wetland degradation. These results highlight key factors contributing to wetland decline and inform future conservation efforts.

Keywords: *Ecosystem, Ihefu Wetlands, Life support, Livelihoods, Wetlands, Mbarali District*

INTRODUCTION

Wetlands are among the most productive and diverse ecosystems in the world providing essential ecological services that support life on the earth

(Balwan and Kour, 2021). They are important ecosystem that acts as the kidneys of the earth (Kaushalya, 2020). According to Mitsch and Gosselink (2015), wetlands are described as the kidneys of the landscape because they function as downstream receptors of water and waste from both natural and human sources. Wetlands are also important habitat for migratory birds and waterfowl, including ducks, egrets, and geese. More than one-third of the species listed as threatened or endangered in the United States live solely in wetlands and nearly half use wetlands at some point in their lives (U.S. Fish & Wildlife Service, 2024; Xu *et al.,* 2024). However, many wetlands are often recognised as important conservation or restoration targets for endemic plants, animals and micro-organisms. Wetlands also host crocodiles, Hippos, flamingos, fish species, and waterbucks, among others.

A wetland is defined as areas of marsh, fen, peatlands or water, 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 metres (Ramsar Convention Secretariat, 2022; 2024). In other words, wetlands are dynamic ecosystems characterised by the presence of water, whether permanent or intermittent (Dixon *et al.,* 2016; Mandishona and Knight, 2022). A wetland is also loosely defined as a vegetated area that is flooded either permanently or seasonally (Balwan, 2021). Wetlands range in size from less than one acre to thousands of acres (Balliett, 2026) and can take many forms. Livelihood refers to the means and resources through which individuals or households secure the necessities of life, such as food, water, shelter, and income (Singh & Mishra, 2025). It encompasses various activities, assets, and strategies that people employ to sustain themselves economically and socially. This paper adopts the definition suggested by Chambers and Conway, which defines livelihood as the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks, and maintain or enhance its capabilities and assets both now and in the future, without undermining the natural resource base (Chambers & Conway, 1991; Scoones, 2022).

Wetlands are among the most important ecosystems on Earth because they provide essential ecological services and sustain biodiveristy, water resources, and humans' livelihoods (Mitsch and Gosselink, 2015; Mitsch, 2021). The wetland ecosystem is valuable for flood control, water quality

improvement, shoreline erosion control, a source of natural products, and recreation and aesthetics (Fischbach, 2023). In African countries, wetlands are critically important to the livelihoods of millions of people (Kipkemboi, 2025) and other living organisms. Wetlands are diverse, including a range of ecosystems such as mangrove forests, peatlands, and floodplains (Ramsar Convention Secretariat, 2016). They contribute in diverse ways to the livelihoods of millions of people in Sub-Saharan Africa (Kipkemboi, 2025). One of the most important functions of wetlands is their ability to support a diverse life of plants, animals and microbes (Mitsch and Gosselink, 2015). Wetlands also provide habitats for a variety of plant and animal species, including migratory birds and endangered species such as gorillas and chimpanzees (UNEP, 2020). Wetlands are home to large mammals such as elephants and hippos, which play an important role in supporting local tourism industries (UNESCO, 2021). Wetlands provide essential habitat for a wide range of species, many of which are unique to these environments, such as flamingos and ducks. Wetlands support life, as they provide various services and are the main source of water throughout the year.

Wetlands are also used for the cultivation of crops such as rice (paddy) which is a staple food for many people. For example, the Inner Niger Delta in Mali, wetland supports an estimated 1.5 million people through rice cultivation and fishing (UNESCO, 2021). Wetlands also provide grazing land for livestock, which is an important source of income for many pastoralist communities in Africa (Wangui, 2024). Wetlands are also important in mitigating the impacts of climate change, as they store water during droughts and dry seasons. It stores large amounts of carbon in its soils and vegetation, which helps reduce greenhouse gas emissions and slow the rate of climate change (UNEP, 2020).

Furthermore, wetlands help to mitigate the impacts of extreme weather events such as floods, storms, and droughts, which are becoming increasingly common in many African countries (Babaniyi et al., 2025). However, wetlands are vital ecosystems that support a wide range of life and provide numerous benefits to humans. In African countries, wetlands are important for the roles they play in supporting biodiversity, traditional livelihoods, agriculture, and climate change mitigation. However, wetlands in Africa are under threat from a variety of human activities, including farming, grazing, and settlement.

Tanzania is rich in wetland resources, including the Great Lakes system, inland drainage systems, major river networks, and deltaic mangrove areas. About 10% of the country's land is covered by wetlands, mainly floodplains and rivers such as the Usangu, Pangani, lower Rufiji, Wami, and Ruvuma floodplains, and the Kilombero wetland (Vice President's Office, 2022). Ihefu wetland is one of the wetlands in Tanzania. Ihefu wetland is an important ecosystem to the local community and to the national economy at large (National Environment Management Council, 2022; Tanzania Electric Supply Company, 2024). About 65% of national hydropower in Tanzania is generated from waters originating from the Ihefu wetland (Tanzania Electric Supply Company, 2024; Ministry of Water and Energy, 2023). Despite the ecological importance of the Ihefu wetland ecosystem, it faces various challenges, both human-induced and natural. The wetland is threatened by population growth, urbanisation, pollution, and the expansion of farmland, grazing land, and settlements (Ramsar Convention Secretariat, 2016; Ministry of Natural Resources and Tourism, 2025). Natural wetlands are in decline through-out the world (Ramsar Convention Secretariat, 2021) and in Tanzania as well **(**National Environment Management Council, 2023). Although numerous studies have documented the ecological importance of wetlands in Africa, few empirical studies have quantitatively examined how the Ihefu Wetland specifically contributes to local livelihoods while simultaneously facing increasing anthropogenic pressures. This study addresses this gap by integrating household survey data with qualitative evidence to evaluate both the socio-economic importance and conservation challenges of the Ihefu Wetland. This paper responds to two specific objectives; (i) to examine challenges facing Ihefu Wetland Ecosystem and (ii) to assess the importance of Ihefu Wetland on the livelihoods of local community in Ihefu Wetland**.**

RESEARCH METHODOLOGY

This paper explores the effects of the life-support ecosystem in Ihefu Wetland, Mbarali District, Mbeya Region. The Great Ruaha River feeds the Ihefu wetlands. The study was conducted in Ihefu Wetland Ecosystem in March and April 2025. A total of 150 respondents were involved in this study. The sample size for this paper was calculated using Yamane's (1967) formula:

$$n = N/(1+Ne^2)$$

where: n represent sample size; N represents the study population and e is the desired level of precision i.e. 0.05.

Given: Population size of 240; Margin error of 0.05, the obtained sample size is 150

$$n = 240/1 + 240*(0.05)^2 = 150$$

$$n = 240/1+240(0.0025)$$
$$n = 240/1+0.6$$
$$n = 240/1.5$$
$$n = 150$$

The sample size for this paper is 150 respondents.

Data and information in this study was collected in the field using questionnaires, in-depth interviews and observations. The questionnaire was developed based on the study objectives and the review of the relevant literature on wetland ecosystems, livelihood activities and ecosystem services. The set of the questionnaire consisted of questions covering respondents' socio-economic characteristics, livelihood activities, utilisation of Ihefu wetland resources and challenges affecting livelihoods. Both closed-ended and open-ended questions were included. The questions were designed to correspond directly with the study objectives. For the validity, the questionnaire was reviewed by experts with knowledge and experience in environmental management, wetland ecosystems and rural livelihoods. The reviewers assessed whether the questions were clear and adequately covered the concepts and variables under investigation. Their comments and recommendations were incorporated before the questionnaire was administered to respondents. This process helped improve the relevance, clarity, and comprehensiveness of the questionnaires.

The questionnaire was pre-tested to 10 respondents who had characteristics similar to those of the target population but were not included in the final sample. Based on the feedback obtained during the pre-test, some modifications were made to the wording and clarity of some questions before the final questionnaire was administered. The reliability of the questionnaire was enhanced through pre-testing before the main data collection. A critical documentary literature review was conducted to support the primary data collected in the field. Both qualitative and quantitative information was collected. Exploratory-descriptive research design was adopted in this study. A random sampling technique was used to obtain a sample of 150 respondents, and a

purposive sampling technique was used to obtain 10 key informants. However, the collected data were analysed using SPSS version 25 and conceptual content analysis. Descriptive statistics, including frequencies and percentages, provided a summary of the findings. Results were presented in tables and narratives (verbatim).

The study obtained institutional approval before data collection. The research permit was obtained from the Open University of Tanzania to introduce the researcher in the Mbarali District. Respondents were informed about the purpose of the study and provided informed consent to participatein the study. Participation was voluntary, and confidentiality and anonymity of respondents' information were maintained throughout the study.

RESULTS

Socio-Economic Demographic Characteristics of the Respondents

This section presents information on the socio-economic and demographic characteristics of 150 respondents who were interviewed in the survey. Table 1 presents the characterists of the heads of households based on gender, age, education level, major sources of livelihoods and monthly income. The majority of respondents were male (72.7%) and aged 31-45 years (36.7%; Table 1). The data show that 21.3% of participants have attained primary education, while just 40.7% have reached secondary school. About 14.7% of the respondents had not attended school at all, while 23.3% had higher education. Major sources of livelihoods were diverse; the data shows that the majority of the respondents depended on farming (39.3%) and livestock keeping (31.3%), while 5.4%, a small proportion of respondents depended on tourism, forestry, petty trade, and food vendors (Table 1). The distribution of major livelihood sources varied significantly among respondents (χ^2 = 72.08, df = 5, $p < 0.001$). This result indicates that respondents' major livelihood sources were not equally distributed. Farming and livestock keeping accounted for much larger proportions of respondents than the other livelihood categories.

Table 1:
Socio-economic demographic characteristics of respondents

Characteristics	Response value	Frequencies	Percentages
Gender of respondents	Male	109	72.7
	Female	41	27.3
	Total	150	100.0
Age of respondents	18 - 30	35	23.3
	31 - 45	55	36.7
	46 -60	41	27.3
	61+	19	12.7
	Total	150	100.0
Education level	Informal education	22	14.7
	Primary education	32	21.3
	Secondary education	61	40.7
	Higher education	35	23.3
	Total	150	100.0
Major sources of livelihoods	Farming	59	39.3
	Livestock keeping	47	31.3
	Fishing	15	10.0
	Tourism	11	7.3
	Forestry	10	6.7
	Others: petty trade, food vendor…..	8	5.4
	Total	150	100

Source: Field data, 2025

Challenges facing Ihefu Wetlands Ecosystem

In this paper, two main factors affecting the degradation of wetland ecosystems were identified: human and natural factors. Human factors identified included population growth leading to over-consumption of environmental resources in the wetlands. Effects on wetlands include loss of wetland area, changes in the water regime, changes in water quality, and overexploitation of wetland products. The introduction of alien/ exotic species is another threat to wetlands. The findings of this paper showed that urbanisation is associated with various socio-economic activities, as well as the destruction and pollution of wetlands. It is obvious that there is a direct relationship between urbanisation, pollution, and the degradation of wetlands.

In the past, wetlands were often viewed as wastelands because they were seen as unproductive areas of little significance to humans. In this paper, waste refers to something not useful to man (Mhache, 2012; Mwakalobo, 2022), such as garbage. As a result, wetlands were drained; others were filled or altered to other uses and activities, leading to the loss of many wetland ecosystems and the services they provide. Some wetlands were

converted to dumping site and grazing areas. Jangwani Area in Dar es Salaam is one of the wetlands in Tanzania that has been converted to other uses, such as bus parking and playgrounds. Table 2 presents challenges facing wetlands, as collected from household heads interviewed in the Ihefu Wetland Ecosystem.

Table 2:
Challenges facing Ihefu Wetland Ecosystem

Challenges	Responses (n=150)	Percentages
Farming in wetlands	97	65
Dumping area for garbage disposal	75	50
Pollution	65	43
Grazing/ overgrazing	51	34
Unsustainable development	49	33
Climate change	47	31
Tree cutting	27	18

Note: The percentages amounts to more than 100 due to multiple responses

In many areas, including the Ihefu Wetland Ecosystem, land has been converted to agricultural areas to increase production and feed the growing population. Agriculture is the backbone of most developing countries including Tanzania. Farmers rely on rainfall, which is unreliable and unstable; alternatively, people cultivate or graze in wetlands. For this case, agriculture is among the major reason for wetland degradation. The majority of the respondents (65%) raised the alarm that farming in the wetlands poses a great challenge to the Ihefu Wetland. Wetlands are regarded as a virgin land, fertile and retain water for a long time (Table 2). For this reason, farmers cultivate in wetland areas sinceno irrigation is required; the wetland remains wet throughout the year.

Wetlands are becoming areas for garbage, wastewater disposal, and other unwanted materials. About 50% of the respondents believed that dumping waste in the wetlands is a threat. Waste devalues wetlands, as toxic materials are also dumped in them, polluting water used for domestic and other purposes, as reported by 43% of the respondents (Table 2). Pollution is the contamination of wetlands. People are emptying their toilets and pouring the effluent into the wetlands, which then pollute them.

Human activities such as animal grazing, illegal construction and development have negatively affected the wetland. About 34% of the people interviewed pointed out that grazing or overgrazing is another

problem to wetlands (Table 2). Animals clear the areas by eating all the grasses and causing soil compaction, leading to the wetlands disappearing. It was said by one of the pastoralist/ shepherd that, "*Government restricted grazing in the Ihefu Wetland because of the destruction associated with large herds of animals flowing to it*". It was further disclosed that illegal construction and unsustainable development are also threats to wetlands, as pointed out by 33% of the respondents. "*Diversion of water from Ihefu Wetlands for irrigation, irrigation drain wetland then damages the wetlands",* this was said by Mbonile, a farmer in Ihefu Wetlands, Mbeya Region. Natural factors were also identified as threats to wetlands. Climate change was mentioned by 31% of respondents as a threat to wetlands. A long-term drought, coupled with a shortage of rainfall, leads to the disappearance of wetlands (Table 2). Other threats to wetlands were reported by 18% of respondents (Table 2). Other threats to wetlands include tree cutting for charcoal making, poles, timber, and fire burning. However, the respondents were asked general question that, are there challenges facing Ihefu wetlands? The response was yes or no; where 97 responded yes, while 53 responded no. The findings show that 97 respondents (64.7%) reported that Ihefu Wetland faces challenges, while 53 respondents (35.3%) reported that it does not face challenges. The Chi-square goodness-of-fit test indicates that this difference is statistically significant, $\chi^2(1, N = 150) = 12.91, p < 0.001$**.** Therefore, the study provides statistical evidence that the proportion of respondents reporting challenges was significantly higher than would be expected under an equal 50:50 distributions.

Importance of Ihefu Wetland in Supporting Local Livelihoods

Despite the numerous challenges facing wetlands, they continue to play a vital role for multiple ecological and socio-economic reasons. It was disclosed that wetlands are a main source of water for domestic use, power generation, irrigation, industrial use, and watering animals, to name a few. It acts as a sponge, releasing water very slowly and replenishing water bodies such as rivers, lakes, dams, ponds, streams, and wells. Wetlands are a source of water, as supported by 74.5% of respondents (Table 3). The old man interrogated in the Ihefu Wetland said this, "*The wetland is a life-support ecosystem because it provides water that we use for many different activities. Without it, life for all living organisms would be impossible or seriously threatened*." This argument was supported by women who were found carrying buckets of water. One of them explained, "*During the dry season, we are forced to collect water from the valleys because they usually have water throughout the year*."

One pastoralist encountered in the Ihefu Wetland stated, "*This wetland is a life-support system for our livestock. Most of the time, we bring our animals here to access water because this area has sufficient water year-round. Especially during the dry season, this place becomes very important for the survival of our animals*."

Table 3:
Ecological and socio-economic importance of Ihefu Wetland

Importance of wetlands	Responses (N=150)	Percentages
Source of water	112	74.7
Habitats of wild	95	65.3
Flood and erosion control	89	59.3
Storage of water	87	58.0
Water purification	84	56.0
Nutrient cycling	61	40.7
Wetlands supports horticulture	60	40.0
Education	45	30.0

Note: The total percentage exceeds 100% because respondents were allowed to select multiple responses

Wetlands are habitats for many living organisms, as they provide essential ecological functions and services that support life on Earth. Wetlands also serve as important habitats for biodiversity, supporting a wide range of plant and animal species adapted to wetland ecosystems. Table 3 showed that wetlands are home to wildlife, including threatened and endangered species. About one-third of all plants and animals listed as threatened or endangered species depend on wetlands for their survival, including flamingos and several orchid species. An old woman interviewed in the Ihefu Wetland had this to say, "*We used to see frogs and other plants in areas with water, but now frogs are not seen; even plants we used to see have disappeared. I think the cause may be humans who have disturbed the area through farming, grazing and establishment of settlements.***"** About 65.3% of the people interviewed supported the assertion that wetlands are habitats for several living organisms. The Officer of Tanzania Forest Services (TFS) interviewed said this, "*Some wetland areas are breeding environments for fish and other creatures like frogs. In some areas, including Ihefu Wetland, these organisms have disappeared due to human interference****".*** Floods and soil erosion can result from both natural processes and human activities. Human actions such as deforestation, poor agricultural practices, overgrazing, urbanisation, and inadequate land management accelerate erosion and increase flood risks. Together, these factors not only damage ecosystems and infrastructure but also threaten food security and human livelihoods.

Wetlands act as natural reservoirs that collect and store water, thereby helping to control floods and reduce soil erosion by releasing water slowly over time. About 59.3% of the respondents supported the argument that wetlands control floods and soil erosion (Table 3). The ability of wetlands to retain water during heavy rainfall helped reduce the severity of downstream floods. The dense vegetation in wetlands also helps to stabilise soils and reduce erosion, which is important in areas with steep slopes or in coastal areas (Spandana *et al.,* 2026).

A water engineer interviewed in Mbarali District said this, "*Wetlands offer number of services such as water purification, filtering sediment, nutrient cycling and carbon sequestration".* The water engineer's argument was supported by the Primary School Teacher, who said this. *"During rainy seasons, water has colour, when it is collected in the wetlands, after some time, the water released is clean, colourless, and it can be used for different uses."* About 56% of the respondents enjoyed clean water released from Ihefu Wetland (Table 3). **"***Wetlands minimise the global warming effect, absorbing pollutants in the water, and it is the habitat for biodiversity*", said one of the village chairmen. The ecologist interviewed emphasised that, "*Wetlands act as natural filters; they remove pollutants and excessive nutrients from water before it enters lakes, rivers, and other aquatic systems.*" Nutrient cycling as a function of wetlands was appraised by 40.7% of the people interviewed (Table 3). This function (nutrient cycling) is critical for maintaining the health of freshwater ecosystems and for providing clean drinking water to millions of people worldwide (Mitsch and Gosselink, 2015). In some wetland systems, this cleansing function also enhances the quality of groundwater supplies. Nutrients and plant material flushed from wetland systems during storms provide essential food to plants, fish, and wildlife in estuaries and other downstream ecosystems. In Tanzania, paddy does much better in wetlands than in irrigated areas.

Horticulture performs well in wetlands, as indicated by 40% of respondents (Table 3). Horticulture involves growing short-term, time-limited crops like vegetables, fruits, flowers, ornamentals, and lawn grasses, typically on a smaller scale. Wetlands in different areas help recharge the aquifer, raising water tables and making the area wet and suitable for horticulture. Wetlands offer significant opportunities for education and research, as supported by 30% of respondents. Wetlands provide countless opportunities for environmental education and offer

research sites for researchers and university students. Ihefu Wetland supports education and research by serving as a natural laboratory for ecological studies. It provides avenues for students and scientists to explore biodiversity, water resource management, and conservation practices. Research conducted in Ihefu Wetland informs sustainable livelihoods and environmental policies, enhancing both academic knowledge and community awareness.

When respondents were asked to state whether wetland is important or not, 141 reponded it is important while 9 repondend it is not important. The results of the Chi-square goodness-of-fit test indicates a statistically significant difference between the observed and expected frequencies. The findings indicate that the majority of respondents (141; 94.0%) perceived Ihefu Wetland as ecologically and socio-economically important, while only 9 respondents (6.0%) did not consider it important. A Chi-square goodness-of-fit test showed that this distribution differed significantly from an equal distribution, $\chi^2(1, N = 150) = 116.16$, $p < 0.001$. This suggests that respondents overwhelmingly perceived Ihefu Wetland as important in ecological and socio-economic terms.

DISCUSSION OF THE RESULTS

A wetland is sometimes known as wasteland. Wetlands are considered wastelands, areas for waste disposal where effluents from industries, homes, and other institutions are disposed of, deposited, or directed due to a lack of awareness and appreciation of the importance of wetlands to life. Wasteland includes areas that cannot be immediately put to productive use, such as valleys, waterlogged areas, steep-sloped areas, rocky areas, bare land, and unfertile land. For these area to be productive, investment is a must. Previously, wetlands were neither protected nor conserved (Schuster *et al.,* 2024). Human beings undervalue, overexploit, and destroy wetland areas through unsustainable activities such as overgrazing, overutilization of wetland resources, and poor agricultural practices.

Wetlands are treated as common land; land that can be used by anyone for any activity without any restriction. The theory of common advocate this, any resources without owner or binding regulations, it can be misused, then degraded. The same can happen to wetlands since most wetlands are free resources as anyone can use it with no care. It was found that the wetland is a wasteland because it accumulates waste materials from different areas, including chemicals (toxins) and fertilisers swept from

agricultural farms, litter from pits, and other unwanted materials scattered on the land. As a result, wetlands were often drained, filled, or altered to make way for other activities, leading to loss of many wetland ecosystems and the services they offer.

However, wetlands like sponges hold or store water and release it slowly, thereby reducing the effects of major catastrophes such as floods, drought, ice melt, and sea rise (Kaushalya, 2020). Similar findings have been reported by Mitsch and Gosselink (2015), indicating that wetlands regulate hydrological cycles worldwide. However, the higher dependence observed in Ihefu may reflect the semi-arid climatic conditions of southern Tanzania. It plays an important role in nutrient cycling, serving as important carbon and nitrogen sinks. It further stores large amounts of carbon in its soils and vegetation, helping mitigate climate change by reducing the amount of carbon dioxide released into the atmosphere (Prajapati *et al.*, 2023). A closer analysis of data collected across different research indicated that community leaders and government officials are entrusted with their positions to influence community management of wetlands. These leaders are able to note the value and threats posed to wetlands. According to Kaushalya (2020), wetlands are among the most and valuable ecosystem that act as the "kidneys" of the earth. Furthermore, wetlands play an important role in providing environmental services. Human activities, including farming and grazing, disturb its functions, leading to the destruction of wetlands. Wetlands cover approximately 6% of the earth's surface (Ramsar Convention Secretariat, 2022; 2024). Wetland filters, clean and store water, and are home to aquatic life.

Wetlands have been severely affected by land-use changes across sub-Saharan Africa (UNESCO, 2021). Land-use changes have caused changes in vegetation cover, especially the conversion of wetlands to other land uses such as cropland and grazing land (UNESCO, 2021). In extreme cases, land use and land cover changes have been cited as one of the factors contributing to global climate change (Roy et al., 2022) and to the depletion of wetlands. Pristine habitats for wildlife are rapidly diminishing as human demand for land expands, and wetlands, among the most vital ecosystems, are at risk, losing their ability to support biodiversity, filter water, and buffer communities against floods. The trend in biodiversity shows that biodiversity loss caused by human population growth is driven by demand for arable land for farming and settlement (Allan *et al.*, 2019). Anthropogenic factors are the main threats

to wetlands, including land-use change, population growth, and urbanisation. However, human activities, environmental factors, climate change, disasters, development activities, economic activities, and agricultural activities have been identified as the major factors influencing the degradation of wetlands in the Ihefu Wetland Ecosystem.

CONCLUSION AND RECOMMENDATIONS

It is recognized that the value of wetlands is very high. Historically, wetlands were mistakenly regarded as wastelands; however, contemporary ecological research recognizes them as highly productive ecosystems that provide invaluable ecosystem services. Wetlands serve as nurseries for fish and other aquatic species, supporting the livelihoods of millions of wild and human beings. Wetlands are carbon sinks, helping to mitigate climate change by storing and sequestering carbon. Wetlands provide cultural, spiritual, and recreational values to communities. However, the rise of urbanisation in different areas and the impacts of humans on wetlands have also increased, as wetlands are rich in resources. Depletion of wetland resources due to deforestation, overcutting of trees, economic use, and illegal activities are the main identified reasons in this paper. For these reasons, wetland areas have decreased and failed to provide the required services.

In conclusion, a world without wetlands is a world without water. The degradation of wetlands significantly threatens water security, biodiversity conservation, and sustainable livelihoods. Without wetlands, a wide range of ecological benefits and ecosystem services would not be possible, including regulating the climate, processing nutrients, sequestering carbon, and improving habitat. It is evident that Ihefu wetlands in Tanzania have significant potential for the livelihoods of animals, people, and other organisms. The effective management of wetlands through the involvement of local people, enforcement of by-laws, and the provision of other incentives might have contributed greatly to the improvement of the Ihefu wetland ecosystems. Despite the challenges facing wetlands, the findings of this paper provide a useful benchmark for rescuing wetlands.

A wetland support life of living organisms; it should be protected and conserved at any cost. The study recommended that land-use plans and land management must be adhered to control the misuse and degradation of wetlands. Conservation and restoration of wetlands are crucial to their protection and the sustenance of ecosystems for current and future

generations; to ensure this, many countries have implemented laws and policies to protect wetlands. There are also international agreements such as the Ramsar Convention on Wetlands, which seeks to conserve and use wetlands sustainably.

Competing interests: The authors have no relevant financial or non-financial interests to disclose.

Funding declaration: There was no funding for this publication.

Data availability: The datasets generated and analysed during the current study are available from the corresponding author upon request.

REFERENCES

Allan J. R., Watson J. E. M., Di Marco M., O'Bryan C. J., Possingham H. P., Atkinson S. C., et al. (2019). Hotspots of human impact on threatened terrestrial vertebrates. *PLoS Biol.* 17(3): e3000158. https://doi.org/10.1371/journal.pbio.3000158.

Babaniyi, G. G., Akor, U. J., Olagoke, O. V., & Daramola, O. E. (2025). Climate change impacts on wetlands: Vulnerabilities, adaptation, and mitigation strategies. In *Wetland ecosystems: Conservation strategies, policy management and applications* (pp. 165-195). Cham: Springer Nature Switzerland.

Balasubramanian, A. (2008). Ecosystem and its components. *Centre for Advanced Studies in Earth Science: University of Mysore, India, 28*.

Balliett, J. F. (2026). *Wetlands: environmental issues, global perspectives*. Taylor & Francis.

Balwan, W. K., & Kour, S. (2021). *Wetland-an ecological boon for the environment. East African Scholars Journal of Agriculture and Life Sciences, 4 (3), 38–48.* https://doi.org/10.36349/easjals.2021.v04i03.001.

Chambers, R., & Conway, G. (1991). *Sustainable rural livelihoods: Practical concepts for the 21st century* (IDS Discussion Paper No. 296). Institute of Development Studies.

Davidson, E. A., & Janssens, I. A. (2006).Temperature sensitivity of soil carbon decomposition and feedbacks to climate change. *Nature*, 440(7081), 165-173.

Dugan, P.J. (Ed.) 1990. *Wetland Conservation: A review of current issues and required action.* IUCN, Gland, Switzerland. 96 pp.

Fisher, J. R. B., Whittaker, R. J., & Malhi, Y. (2019). ET come home: the

potential of ecohydrology for wetland restoration. *Frontiers in Ecology and the Environment*, 17(2), 93-101.

Fischbach, J. R., Bond, C. A., Dalyander, S., Carruthers, T., & Hemmerling, S. A. (2023). *Enhancing Benefits Evaluation for Water Resources Projects: Towards a More Comprehensive Approach for Nature-Based Solutions.* The Water Institute of the Gulf. Funded by the U.S. Army Corps of Engineers Engineer.

Kaushalya, G. N. (2020). Wetlands becoming wastelands; factors contributing to the degradation of wetlands in Sri Lanka. *International Journal of Research and Analytical Reviews*, *7*, 713-718.

Kipkemboi, J. (2025). Balancing between conservation and livelihoods in African inland wetlands: Synthesis of published information, reflection of reality on the ground, and review of possibilities for sustainable use. *East African Journal of Environment and Natural Resources*, 8(2). https://doi.org/10.37284/eajenr.8.2.3307.

Wangui, E. (2024). Pastoral livelihoods in Africa. In *Handbook of African economic development* (pp. 359-374). Edward Elgar Publishing.

Mandishona, E. and Knight, J. (2022). Hydrological and ecological functioning of wetlands in southern Africa: A review. *Physics and Chemistry of the Earth, 127*, 103–114.

Masija E. H. 191. 1991. Irrigation of wetland in Tanzania. In proceedings of a seminar on wetland of Tanzania. Morogoro, Tanzania. Pp 73-75.

Ministry of Water and Energy. (2023). *Hydrological contribution of the Ihefu Wetland to national hydropower generation in Tanzania.* Government of Tanzania.

Mitsch, W. J., & Gosselink, J. G. (2015). *Wetlands*. John Wiley & Sons.

Mitsch, W. J. (2021). *Wetland ecosystems: Understanding long-term human impacts.* Springer.

Mhache, E. P. (2012). Dar es Salaam City and Challenges in Solid Waste Management. The Case of Manzese and Sinza Wards in Dar es Salaam. *Huria: Journal of the Open University of Tanzania*, *10*(1), 78-91.

Mwakalobo, A. P. (2022). *Historical perceptions of wetlands: From 'wastelands' to valuable ecosystems.* Dar es Salaam University Press.

National Environment Management Council. (2022). *Ihefu Wetland hydrology and its role in supplying water for national hydropower production.* NEMC Tanzania.

National Environment Management Council. (2023). *Status and trends of*

wetland ecosystems in Tanzania: Drivers of decline and conservation challenges. NEMC Tanzania.

Prajapati, S. K., Choudhary, S., Kumar, V., Dayal, P., Srivastava, R., Gairola, A., & Borate, R. (2023). Carbon sequestration: A key strategy for climate change mitigation towards a sustainable future. *Climate Change*, *2*, 1-14.

Ramsar, C. S. (2016). An introduction to the convention on wetlands (previously The Ramsar Convention Manual). In *Ramsar Convention Secretariat, Gland, Switzerland*.

Ramsar Convention Secretariat. (2021). *Global wetland outlook: Status and trends of wetlands worldwide*. Ramsar Convention on Wetlands.

Ramsar Convention Secretariat. (2022). *The Ramsar Convention on Wetlands: Texts and annexes*. Gland, Switzerland.

Ramsar Convention Secretariat. (2024). *Global Wetland Outlook: Special edition 2024*. Gland, Switzerland: Author.

Roy, P. S., Ramachandran, R. M., Paul, O., Thakur, P. K., Ravan, S., Behera, M. D., ... & Kanawade, V. P. (2022). Anthropogenic land use and land cover changes—A review on its environmental consequences and climate change. *Journal of the Indian Society of Remote Sensing*, *50*(8), 1615-1640.

Scoones, I. (2022). *Sustainable livelihoods and rural development* (2nd ed.). Practical Action Publishing.

Singh, G., & Mishra, A. K. (2025). Livelihood-Definition, concept and livelihood pattern in urban and rural areas, a book entitled Farming Based Livelihood Systems. Page 342-7183.

Spandana, K., Rajwade, Y. A., Ramana Rao, K. V., & Pruthvi Raj, J. (2026). Impact of Soil Erosion on the Environment, Climate, Ecology, and Economy. In *Advancements in Soil Conservation: From Traditional Practices to AI-Driven Solutions* (pp. 561-588). Cham: Springer Nature Switzerland.

Strayer, D. L. 2009. *Alien species in fresh waters: ecological effects, interactions with other stressors, and prospects for the future.* Freshwater Biology.

Tanzania Electric Supply Company. (2024). *Water resource dependence of Tanzania's hydropower sector: The case of the Ihefu Wetland.* TANESCO.

UNEP. (2020). Wetlands. United Nations Environment Programme. https://www.unep.org/resources/report/wetlands.

UNESCO. (2021). African wetlands. United Nations Educational, Scientific and Cultural Organization.

https://en.unesco.org/themes/water-security/hydrological-change-and-water-resources-management/wetlands/african-wetlands.

United Nations Environment Programme. (2021). Ecosystems. Retrieved from https://www.unep.org/resources/infographic/ecosystems.

U.S. Fish & Wildlife Service. (2024). *Status and Trends of Wetlands in the Coterminous United States: 2009–2019*. National Wildlife Federation.

Vice President's Office. (2022). *National environmental master plan for strategic interventions (2022–2032).* Government of Tanzania.

Xu, T., Weng, B., Yan, D., Wang, K., Li, X., Bi, W. & Liu, Y. (2019). Wetlands of international importance: Status, threats, and future protection. *International Journal of Environmental Research and Public Health*, *16*(10), 1818.

.