

# BASELINE STUDY REPORT ON POTENTIAL SITES FOR RESTORATION ALONG NABAKAZI WETLAND ECOSYSTEM IN MUBENDE DISTRICT



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*Plate 1 : Kabweyakiza Lower - Village in Madudu Sub county showing wetland boundary markstones illegally shifted into the wetland to create land for agriculture*

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## LIST OF ACRONYMS AND ABBREVIATIONS

CAO	Chief Administrative Officer
CBD	Convention on Biological Diversity
DLG	District Local Government
DDP	District Development Plan
DEO	District Environment Officer
DLG	District local Government
DNRO	District Natural Resources Officer
DWAP	District Wetland Action Plan
DWRM	Directorate of Water Resources Management
EAC	East African Community
GoU	Government of Uganda
LC	Local Council
MWE	Ministry of Water and Environment
MoU	Memorandum of Understanding
MWE	Ministry of Water and Environment
NAPE	National Association of Professional Environmentalists
NEMA	National Environment Management Authority
NGO	Non - Governmental Organization
PDM	Parish Development Model
PKN	Partner für Klima und Natur gGmbH
RDC	Resident District Commissioner
RIS	Ramsar Information Sheet
SOPs	Standard Operating Procedures
WMD	Wetland Management Department

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## EXECUTIVE SUMMARY

National Association of Professional Environmentalists (NAPE) commissioned a baseline survey to inform the project that is underway for implementation intended for the restoration of Nabakazi Wetland Ecosystem in Mubende District. The study aimed at: identifying and documenting the core drivers of Nabakazi Wetland Ecosystem degradation; Identifying and documenting tenants/leasees, Land lords and target communities that could benefit from restoration efforts along Nabakazi Wetland Ecosystem. In addition, current efforts in the conservation of the wetland and the parties involved such as international organizations, NGOs, Faith-based groups, women groups, youth groups, corporative groups in the study area were documented. Information pertaining to Government work as the public trustee of wetlands in the country, in particular Nabakazi Wetland Ecosystem was collected.

This study was conducted in the sub-counties through which Nabakazi wetland Ecosystem traverses. These were: Madudu, Kalonga, Kitenga, Kayebe and Kigando. Kiye wetland was a special case of attention, neighbouring Kaweri Coffee estate, which has played a phenomenal role in conservation of one side of Kiye wetland and associated ecosystems such as riverine forests along their coffee estate. Beside that Kiye drains its water into Nabakazi Wetland /river and thus contributes significantly in aspects of conservation. This has maintained biodiversity abundance in the areas around Kaweri coffee plantation, an area where other coffee farmers could learn from, especially the use of shade trees which optimises carbon sequestration/capture, thus contributing to climate mitigation actions.

Methods used to carry out the study included: Focus group discussions with Sub County chiefs and members of the lower LC; with the help of the research assistant. Transect walks along the wetland sectors

guided by local leadership; Opportunistic observation on wild animals encountered; Document reviews at District, web-based literature review; Technical consultations with Environment and Natural resources department, Land office and Community development; and Opportunistic home-stead visits where interviews with heads of the households were conducted. Landlords and tenants whose land touched Nabakazi Wetland Ecosystem were also interviewed.

The main Drivers of Nabakazi degradation are quite many but the most important ones identified were: need for Land for Agriculture particularly crop farming, for ever increasing population, water for Irrigation and watering livestock, waste disposal, brick making among others. Mubende being one of the areas that experience prolonged drought spells, there is tendency of communities farming in the wetland or very close to the wetland for easy access to wet soils and water for irrigation. The area is also hilly, and therefore arable land to communities is mainly available in valleys where flood plains and swamps are found. However, it is important to note, that majority of those who were interviewed are willing to participate actively in the restoration of degraded areas, while implementing wise use and environmentally friendly interventions. The government has created awareness about the need for conservation of the wetlands. Despite these efforts, in most areas this has received minimal response with regard to buffer zone observation by communities.

Degradation of Nabakazi Wetland Ecosystem was found to be severe in all sub-counties visited. Sections for immediate restoration have been identified in Madudu, Kalonga, Kayebe and Kitenga where the EACOP pipeline is crossing Nabakazi Wetland Ecosystem. The following Interventions are recommended as part of the im-

plementation: establishing Water retention facilities for Irrigation and watering of live-stock; Extend water to communities in addition to protecting wells which have been identified; form Water user committees to manage water use and infrastructure; mandated institutions should demarcate wetland boundaries and where necessary re align the mark stones and confirm them using dereferenced coordinates; carry out restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration sites; consider using an investor for bottling of Nabakazi water and branded as such; promote enterprises that will market and add value to produce from the Nabakazi catchment (such as honey). Consideration should be made for more awareness on the definition of wetlands as they can be permanent or seasonal such that when the water goes beyond the mark stone then community understands it. Along the buffer zone, the communities could be encouraged to plant elephant grass, Napier, Calliandra, lemon grass, bamboo and fruit trees as this can be both environmentally friendly as well as commercially viable for improved community livelihoods.

There is need to protect spring water points along the wetland ecosystem as these are good spots where communities can fetch clean and relatively safe water for domestic use as well as watering animals. The protection of springs will serve as an incentive to protect Nabakazi catchment whose water they access in the protected springs. There is need to identify unique sections of Nabakazi Wetland Ecosystem that will support conservation of the crested cranes as a national bird with habitats facing serious extinction. Detailed studies should be conducted to establish the underlying causes for the monkeys and crested cranes raid-

ing gardens of community members and what could be done to mitigate the likely reduction and extinction of their numbers and diversity.

Restoration in the degraded buffer zones should consider planting/restoration with fruit trees that do not adversely affect the hydrological cycle in which the wetland plays a major role of water storage. The trees emphasized are: Jackfruit, Avocado, Papaws, indigenous mangos, Macadamia, Bamboo and any other species that will maintain a balanced environment. Growing of fodder for livestock should be encouraged. Terraces should be emphasized on hill slopes adjacent to the wetland and the buffer zones to mitigate siltation.

To reduce accelerated soil fertility-decline and degradation, it is proposed that soil and water conservation practices should be promoted in the wetland catchment areas.

Awareness about wetland uses and conservation as well as marketing of their produce should utilize the opportunity of NAPE's Community Green Radio as well as marketing of their produce. Traditionally, women and youth do not own land which limits their participation in decision making towards restoration interventions. Interventions arising from this survey should put in place affirmative action opportunities to facilitate women and youth to participate in wetland conservation and other resources.

It is recommended that a similar or more detailed study is carried out in the districts where Nabakazi Wetland Ecosystem traverses such as Kassanda and Gomba. This will facilitate an ecosystem wide intervention and therefore enhanced functionality and connectivity.

## 1.0. INTRODUCTION

### 1.1. BACKGROUND

The Baseline Study on potential sites for afforestation, reforestation, and restoration along Nabakazi Wetland Ecosystem is based on the principles of importance of natural resources management in-line with a standard definition of a baseline survey for natural resources.

For this assignment, a baseline survey for natural resources is defined as a “study conducted before a project or program to document the initial state of the environment, including its natural resources”. As outlined in the title of the assignment, the study is expected to establish a benchmark against which activities for afforestation, reforestation, and restoration will be implemented in areas of R. Nabakazi Ecosystem in Mubende District. The baseline study is expected to guide future changes and project impacts to guide measures where impact can be measured and assessed. The baseline was therefore focused on carrying out a study to identify potential sites for afforestation, reforestation, and restoration along Nabakazi Wetland Ecosystem in Mubende district.

The survey focused on collectively identifying and documenting the core drivers of the Nabakazi Wetland Ecosystem degra-

ation. Information from the baseline survey has been used to identify areas that are of immediate attention for restoration, co-management with the communities and suggestions are made to enhance benefits from wetlands to improve peoples’ livelihoods while adapting climate change mitigation measures.

The consultant achieved the set objective of undertaking a baseline survey of Nabakazi Wetland Ecosystem using a combination of methods that include key community member participation, using specific measures for the conservation and sustainable use of the targeted wetland ecosystem services. Baseline study methods and tools for its completion included field surveys, and data analysis techniques to assess wetland extent and conservation.

### 1.1. Location of the Undertaking

#### 1.1.0. Geographical Location:

Mubende District is in the Central region. It borders Kassanda District in the East, Kiboga and Kyankwanzi in the North, Sembabule and Gomba in the South, Kyegegwa and Kakumiro in the West. The District headquarters is located 160 Kilometres West of Kampala.



*Vernonia amygdalin* and *V. uniflora*. In more remote and rarely cultivated areas the invasion of forest tree<sup>3</sup> begins at the lower sections of the pediments and results in the appearance 'of fringing forestv.along the valley.

The forest, if undisturbed, may gradually extend upwards into the middle sections of the pediments. With the exception of larger and mature river valleys covered by dens, stands of papyrus (*Cyperus papyrus*) or *Miscanthidiun violaceun* there is no marked change in the dominant plant species between-the pediments and valley bottoms, though in the latter *Loudotiä kagarensis* and a number of sedges are intermixed with

#### 1.1.4. Population

According to National Population and Housing Census (NPHC) 2024, Mubende District Total population was 522,015 person, male 251,165(48%) and Female 270,850(52%). Out of the total households 132,046 Households with improved sanitation were 53,054(40.2%), households with improved source of water 77,340(58.6%), Households using solar electricity for lighting 114,667(87%) and households using grid electricity for lighting 17,379(13.2%).

Out of the total households 132,046 Households engaged in Agriculture were 85,848(65%) and households that were food insecure were 36,313(27.5%)

According to NPHC 2024 results revealed that, Mubende District had 1,100 refugees out of which male 556 and female 544 persons.

The District Local Council is the highest political authority in the District. It is divided into 3 Counties (Buwekula, Buwekula South and Kasambya), 13 Sub-counties, three (3) town councils, 79 parishes, 25 wards and 525 villages.

The community of Mubende is composed of people of different social and ethnic origins with majority being Baganda; 36.1% followed by Banyoro 14%, Banyankole 11.4%, Bakiga 10.7%, Bafumbira 9.9%, Banyarwanda 6.8%, Bakhonzo 3.1%, Batoro 2.5%, Basoga 0.7% and others 4.6%.

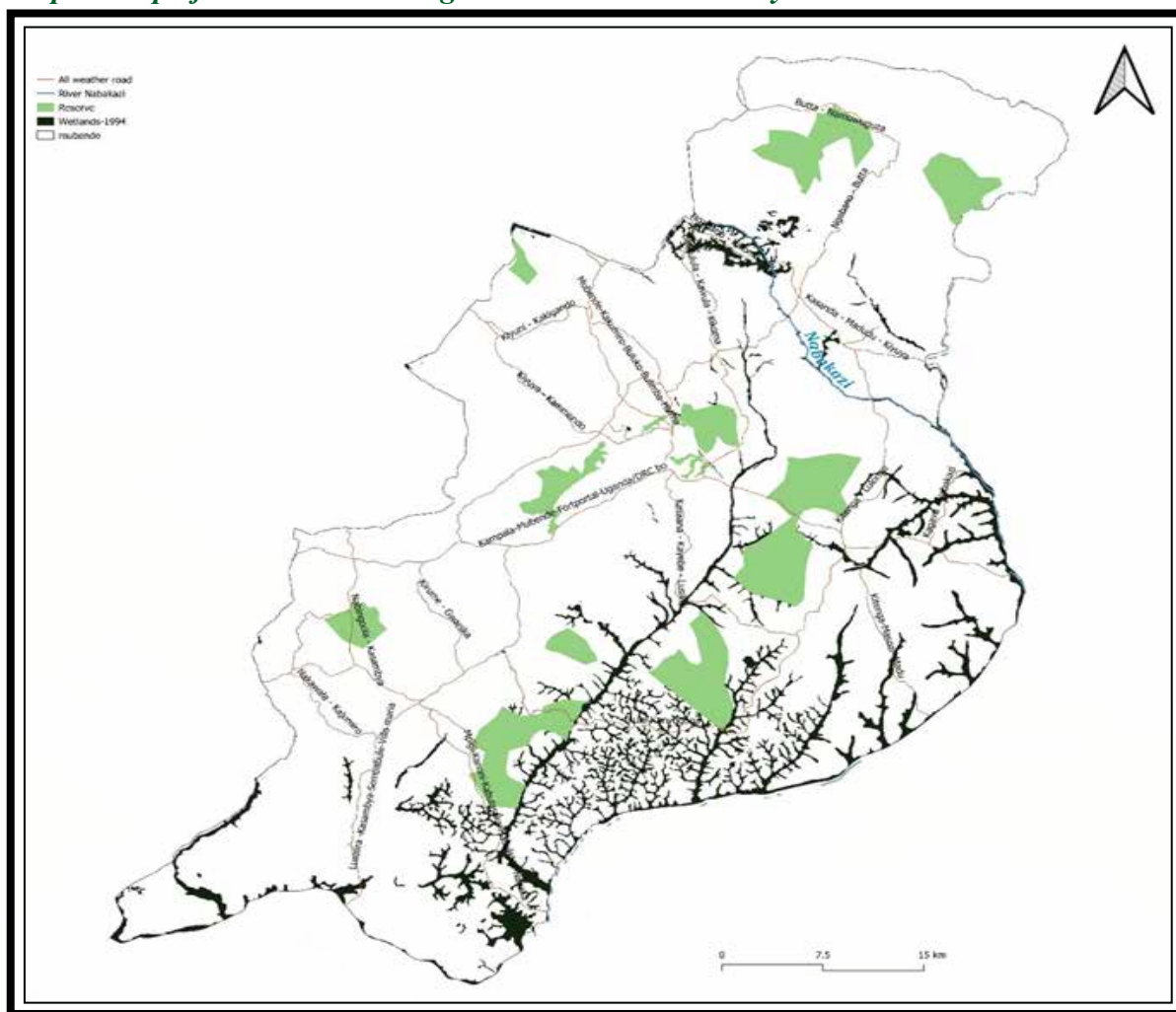
#### 1.1.5. Survey area

The Nabakazi Wetland Ecosystem is located along the boundaries of Mubende, Kassanda, and Gomba, Districts in Central Uganda. The biggest part is in Mubende, with the length of about 64 km. It originates from Madudu Sub County, and traverses the sub counties of Kalonga, Kitenga, Kayebe and Kigando.

Mubende has four Major catchments; that is the Katonga catchment, the Nkuse catchment, the Muzizi catchment and the Kafu catchment which embeds the neighbouring districts like Kiboga and Kyankwanzi. The interconnected nature makes a collective conservation effort paramount. The most amazing part is that these have origins in Mubende District.



**Map 4: Map of Mubende Showing Nabakazi Wetland Ecosystem**



**1.2. Relevancy of the Baseline Survey undertaking**

This baseline study on Nabakazi Wetland Ecosystem is relevant for understanding its current condition, identifying threats and ecosystem services provided, and informing future management, restoration, and policy. By establishing a detailed picture of the wetland’s ecology, biodiversity, and socio-economic context, a baseline study provides the essential knowledge needed to track changes, measure the success of conservation efforts, enhance resilience to climate change, and justify the implementation of sustainable wetland management plans in Mubende and Uganda in general.

The baseline survey will be used to guide key interventions to guide and support the ecosystem in Mubende District Local Government; which is mandated to promote develop, protect and manage the environment including but not limited to water, forests, wetlands, and natural resources.

## 2.0 LITERATURE REVIEW

### 2.1. Introduction

This chapter outlines the literature review derived from other researches, documents and other relevant sources. It also covers international conventions, treaties, regional and national policy and legislation.

Wetland loss and degradation have led to the decline of numerous wetland-dependent species, including migratory birds, amphibians, and fish (Kool et al., 2022). The conversion of wetlands to other land uses, such as agriculture, urban development, and resource extraction, has resulted in significant habitat fragmentation and loss of connectivity between wetland systems (Van Deventer et al., 2021). Peatlands, which store vast amounts of carbon, are being degraded by drainage, fires, and land use changes, contributing to increased greenhouse gas emissions (Schuster et al., 2024). Restored wetlands can recover many of their ecosystem functions, but the recovery of biodiversity and full functionality often takes decades or longer (Bai et al., 2013). Coastal wetlands, such as mangroves and salt marshes, are increasingly recognized for their role in providing natural protection against storms and sea level rise (Jin et al., 2022). Seasonal and interannual variability in wetland hydrology can lead to dynamic shifts in wetland vegetation communities and habitat availability. Groundwater-dependent wetlands are particularly vulnerable to changes in groundwater recharge and extraction, which can alter water availability and wetland functioning (Lefeuvre & Bouchard, 2005). Wetland management approaches that incorporate traditional ecological knowledge and engage local communities can enhance the effectiveness and equity of conservation efforts (Barasa et al., 2021). Valuing the ecosystem services provided by wetlands, such as water purification, flood regulation, and recreational opportunities, can help

justify their conservation and sustainable use (Maua et al., 2022). Collaborations between scientists, policymakers, resource managers, and local communities are essential for developing and implementing effective wetland conservation and management strategies.

#### 2.1.1. Wetlands as sinks, sources, or transformers of sediments.

Wetlands are effective at trapping and retaining sediments due to their unique physical and biological characteristics due to their dense vegetation, complex topography, and slow water velocities that promote the settling and deposition of suspended sediments (Schuster et al., 2024). Wetland plants stabilize sediments and prevent re-suspension, while organic matter accumulation and peat formation contribute to long-term storage (Deil, 2005). Factors like hydroperiod, water depth, and sediment load can influence the efficiency of wetlands in trapping and retaining sediments (Barasa et al., 2021). Wetlands can receive sediment inputs from various sources, including upstream watersheds, surface runoff, bank erosion, and atmospheric deposition. Changes in land use, such as urbanization, agricultural practices, or forestry activities, can alter sediment loads and delivery to wetlands (Opio et al., 2011). Extreme weather events, sea-level rise, and saltwater intrusion can introduce new sediment sources, potentially altering the sediment budget and composition. Wetlands can also serve as sources of sediments under certain conditions, such as erosion within wetlands, which releases stored sediments and transports them to downstream water bodies (Cong et al., 2021). The export of sediments can have significant implications for water quality, aquatic habitats, and the broader landscape (Herbert et al., 2015). Sediments in wetlands play a crucial role in biogeochemical processes, such as

nutrient cycling, contaminant sequestration, and carbon storage (Alexander et al., 2018). The composition and properties of sediments can influence the availability and cycling of nutrients, affecting primary productivity and ecosystem functioning. The storage of organic carbon in wetland sediments is an important component of the global carbon cycle and can contribute to climate change mitigation (Lin et al., 2019).

### **2.1.2. Linkages between water quality changes and sediment dynamics in wetlands.**

Wetland sediments play a crucial role in influencing water quality, with fine-grained sediments adsorbing and transporting pollutants, while organic-rich sediments act as a sink for hydrophobic organic contaminant (Teal et al., 2012). The redox state of the sediments, influenced by factors like water depth and vegetation, can affect the mobility and speciation of sediment-bound pollutants (Gordeev et al., 2022). Wetland vegetation stabilizes sediments, reduces erosion, and promotes sedimentation through the trapping of particulates. The presence and diversity of aquatic macrophytes can influence sedimentation rates, sediment composition, and water flow patterns within a wetland (Lal et al., 2005). Emergent and submerged vegetation also affects water quality by taking up nutrients, filtering suspended solids, and providing habitat for microbial communities that can transform or remove pollutants (Deil, 2005). Hydrological regime and sediment dynamics are also significant factors in wetlands. Increased water flow and flood events can lead to the erosion and mobilization of sediments, potentially carrying adsorbed pollutants into the water column (Meysick et al., 2022). Conversely, periods of low water levels or drought can expose sediments to oxidation, leading to the release of nutrients and contaminants. Changes

in the hydrological regime, either natural or anthropogenic (e.g., water diversions, dams), can alter the sediment budget and water quality in wetlands (Lal et al., 2005). Microbial processes in wetland sediments can play a significant role in the transformation and cycling of nutrients, heavy metals, and organic contaminants. Anaerobic microbial processes, such as denitrification and sulfate reduction, can immobilize certain pollutants but can also release nutrients and methylate heavy metals (Sutton et al., 2019). Aerobic microbial activities, such as nitrification and aerobic biodegradation, can influence the speciation and mobility of sediment-bound contaminants. Sediment accretion and wetland sustainability are also affected by climate change, which can impact wetland hydrology, leading to changes in precipitation patterns, sea-level rise, and extreme weather events (Van Coppenolle et al., 2018). These climatic changes can alter sediment erosion, transport, and deposition processes, potentially affecting water quality and the overall ecosystem balance. Wetland restoration efforts often involve manipulating sediment dynamics to achieve desired ecological outcomes. Careful consideration of sediment properties, contaminant levels, and potential impacts on water quality is crucial when planning and implementing wetland restoration projects (Kim et al., 2022). Monitoring and adaptive management strategies are essential to ensure long-term sustainability of restored wetlands and maintain desired water quality conditions.

### **2.1.3. Wetland hydrology, vegetation, and sediment processes.**

Wetland plant community composition and succession are influenced by the hydroperiod, which is the seasonal pattern of water level fluctuations. Changes in water depth, flood duration, or groundwater levels can favor the growth of different plant species, leading to shifts in the vegetation community over time (Zhu et al., 2023).

The presence and distribution of wetland vegetation can influence hydrology through mechanisms like evapotranspiration, flow resistance, and water storage capacity, creating feedback loops that can maintain the stability of the wetland system or push it towards alternative stable states (Deil, 2005). Wetland plants play a crucial role in trapping and stabilizing sediments, both above and below ground. The root systems and aboveground biomass of aquatic macrophytes can reduce water flow velocities, promoting sediment deposition and preventing erosion (Molinari et al., 2021). The accumulation of organic matter from decomposing vegetation can also contribute to the vertical accretion of sediments, helping wetlands keep pace with changes in water levels (Teal et al., 2012).

The characteristics of sediment, such as texture, nutrient content, and organic matter, can influence the growth and distribution of wetland plants, creating feedback loops (Stoev et al., 2022). The deposition and redistribution of sediments can alter the topography and bathymetry of wetlands, affecting water flow patterns, depths, and the overall hydrological regime (Chen et al., 2019). Integrative feedback loops and ecosystem resilience are essential for effective restoration and long-term conservation of wetland ecosystems in the face of environmental stressors, including climate change (Ochoko et al., 2023).

#### **2.1.4 Wetland conservation, restoration and creation for maintenance of water and sediment quality**

Maintaining the appropriate hydrological regime, including water levels, flow patterns, and hydro period, is crucial for sustaining the desired wetland functions. Changes in natural hydrology, such as changes in water inputs, drainage, or water abstraction, can disrupt the delicate balance and lead to degradation of water quality and sediment dynamics (Ambelu et al., 2013). In

restoration and creation projects, it is essential to design hydrological features to mimic the natural conditions of the target wetland type (Middleton, 2022). Sediment dynamics are essential for sustaining wetland functions, as they trap and retain sediments, preventing their transport downstream and protecting water quality (Kar, 2013). To prevent adverse impacts, it is important to identify and address sources of excessive sediment, such as soil erosion or anthropogenic activities (Siti Rohaeni et al., 2023). Designing restoration and creation projects should consider sediment characteristics, transport, and deposition patterns to ensure desired functions are achieved (Yu et al., 2015). Wetland vegetation plays a central role in stabilizing sediments, filtering water, and regulating nutrient and contaminant dynamics. The selection and management of appropriate native wetland plant species are crucial for maintaining water quality and sediment functions (Wu et al., 2023). Invasive plant species should be actively controlled in conservation and restoration efforts. Landscape context and connectivity are also essential for ensuring the long-term sustainability of water quality and sediment functions (Chatanga et al., 2020). Continuous monitoring of water quality, sediment dynamics, and wetland condition is crucial for evaluating the success of conservation, restoration, or creation efforts.

## **2.2. The Status of Wetlands in Uganda,**

Over 80% of the communities that live close to the wetlands use them for farming, fishing, and livestock grazing (Turyahabwe et al., 2013). However, these benefits are unique, vary and valued differently by many communities (Mazzotta et al., 2019; Schuster et al., 2024). Uganda is endowed with valuable wetland ecosystems spatially distributed, classified as lacustrine wetlands, and riverine or flood plains (Matovu

et al., 2019). The wetlands are characterized by impeding drainage that vary in regards to the period of flooding, depth of water, altitude, soil characteristics and other environmental factors (Wohlfart et al., 2018). It is thought that the wetlands offer qualities, purposes, and benefits that improve the day-to-day lives of people in the neighborhood. (Barakagira & de Wit, 2017) mentioned that in Uganda, over 80% of the wetland fringe communities use wetlands to enhance their livelihoods, including directly being employed by the sector (MWE, n.d.; Turyahabwe et al., 2013). People also obtain products such as fresh water, food, construction material, genetic resources and fuel among others. Wetlands provide ecosystem services such as water purification, flood regulation, habitat provision, and carbon sequestration (Akwetaireho & Getzner, 2010; Ochoko et al., 2023).

### **2.2.1. Wetland management challenges in Uganda**

Uganda's wetlands play a crucial role in providing ecosystem goods and services that positively impact local communities, employing over 2.7 million people. However, the current decline in wetland coverage in Uganda has resulted in 6.7% wetland loss attributed to encroachment and degradation from natural and anthropogenic activities. Northern Uganda experienced the highest reduction in spatial coverage of wetland, with a rate of 34.3% compared to the other regions, followed by Western with 27.9%, Eastern (20.9 %) and central (16.9%). For instance, the wetland system in Lira district has been identified among heavily degraded wetlands in northern Uganda, exhibiting a degradation rate of 57.9% (MWE, 2020). Urban wetland loss ranges from 0.03 to 3.13% each year, with built-up areas, agricultural expansions, and pollution being the three main causes worldwide (Ghosh & Swades Pal, 2023).

These wetland systems are experiencing high population pressure, agricultural encroachment by local communities, political interference, and inefficiencies in wetland management practices. These pressures have disrupted the wetland integrity and led to the continuous shrinkage of spatial coverage. Wetland degradation also contributes to the deterioration in freshwater quality and escalating occurrence of devastating floods (Fuhrmann et al., 2016). Despite these degradations, the wetland spatial coverage and spatio-temporal changes remain inadequately understood. However, the socioeconomic drivers contributing to the evident wetland degradation in Uganda have been studied largely within the Greater Kampala Metropolitan area (Kadoma et al., 2023; Nakiyemba et al., 2020; Omagor & Barasa, 2018).

The local context of the economic and socio-ecological perspectives of wetland degradation in other parts of Uganda remain poorly documented and understood.

### **2.2.2. Challenges and tradeoffs in managing spatial \temporal Wetland changes**

Wetlands are characterized by high spatial variability in hydrology, soils, vegetation, and other characteristics, driven by factors like topography, groundwater interactions, and disturbance regimes (Zhang et al., 2018). This complexity requires detailed data collection and spatially explicit models to understand and predict wetland responses to management actions. Temporal dynamics in wetlands are driven by seasonal, annual, and long-term climatic and hydrological patterns, which can be exacerbated by human activities and climate change impacts (Elmahdi & McFarlane, 2009). Effective management requires monitoring these changes and adjusting strategies accordingly, which can be resource-intensive and challenging (Sun et al., 2015).

Wetland processes and functions operate at multiple spatial scales, from micro-scale interactions within the soil-plant-water matrix to landscape-scale dynamics within a watershed or region therefore balancing these trade-offs requires prioritizing management objectives and understanding the complex interactions between different wetland functions (Kadoma et al., 2023).

Since wetlands are adapted to various natural disturbance regimes, such as periodic flooding, fire, or drought, which play a crucial role in maintaining their ecological integrity and resilience (Pereira et al., 2005), disrupting these regimes, either through human interventions or climate change, can lead to undesirable shifts in wetland structure and function (Tafahomi & Nadi, 2021). Therefore, managers must strike a balance between allowing necessary disturbances to occur and mitigating the impacts of extreme or unnatural disturbances on human communities and infrastructure. Maintaining wetland resilience is crucial for sustaining their long-term viability (Rideout et al., 2022).

Climate change on the other hand is altering precipitation patterns, temperature regimes, and sea levels, affecting wetland hydrology and ecosystem processes. This can lead to shifts in vegetation communities, changes in water availability, and increased vulnerability to disturbances like droughts, floods, and saltwater intrusion (Gherardi et al., 2009). Managers must develop strategies to enhance the resilience of wetlands to these climate-driven changes, such as restoring natural hydrological regimes, creating habitat corridors, or implementing nature-based solutions (Miah et al., 2021). Balancing the needs of wetland conservation with human adaptation to climate change can be a significant challenge (Deil, 2005). Also, land use changes, such as urbanization, agriculture, or resource extraction, can have profound impacts on wetland hydrology, water quality, and habi-

tat quality (Mishra, 2023).

Effective management of wetlands requires coordinating with land use planners, farmers, and other stakeholders to ensure activities in the surrounding landscape are compatible with wetland conservation goals (Vitt et al., 2022). This may involve implementing best management practices, establishing buffer zones, or developing incentive programs to encourage compatible land uses. Invasive species can disrupt wetland communities and ecosystem processes, leading to significant ecological and economic impacts (Bousquin & Hychka, 2019). Strategies may involve early detection, rapid response, targeted control measures, and long-term monitoring to prevent and mitigate the impacts of invasive species (Caracciolo et al., 2023).

Furthermore, hydrological modifications, such as dams, diversions, and drainage, can profoundly alter the natural flow regimes and water budgets of wetland systems, leading to reduced water availability, changes in water quality, and disruptions to the natural cycles of flooding and drought (Galatowitsch, 2018). Balancing the needs of wetland conservation with human water use and flood control requirements is essential. Socioeconomic factors play a crucial role in wetland management decisions, as they often involve trade-offs between ecological, economic, and social considerations (Carpenter et al., 2006).

Incorporating the perspectives and concerns of local communities, indigenous groups, and other relevant stakeholders is crucial for developing equitable and sustainable wetland management plans (Fox & Alexander, 2015). Hence, wetland management faces several challenges, including defining and assessing wetland boundaries, valuing ecosystem services, adaptive management, and addressing knowledge gaps (H. Liu et al., 2020).

Wetlands are complex systems with transitional nature between aquatic and terrestrial ecosystems, and their hydrological and ecological characteristics can be difficult to define due to inconsistencies in classification systems and legal and regulatory definitions (Cadier et al., 2020). Robust protocols for wetland delineation and classification are crucial for informed management decisions and monitoring changes over time. Ecosystem service valuation is another challenge, as wetlands provide a wide range of services that are often undervalued or unaccounted for (Pereira et al., 2005).

Accurately quantifying the economic, social, and environmental benefits of wetland ecosystems is essential for conservation and sustainable use. Innovative approaches for ecosystem service valuation, such as natural capital accounting or payment for ecosystem services schemes, can help address this challenge (Koch et al., 2023). Adaptive management is necessary to respond to changing conditions and new information, requiring continuous monitoring, evaluation of management strategies, and adjustments to achieve desired outcomes (Maua et al., 2022). Implementing adaptive management can be resource-intensive and requires high-quality, long-term monitoring data. International Journal of Academic Pedagogical Research (IJAPR) ISSN: 2643-9123 Vol. 8 Issue 9 September - 2024, Pages: 84-96 www.ijeais.org/ijapr 90 Collaborative governance structures, such as multi-stakeholder partnerships or watershed-based management approaches, can facilitate more integrated and equitable wetland management (Mazzotta et al., 2019). These efforts can enhance the resilience of wetland systems by leveraging the knowledge, resources, and problem-solving capacities of diverse stakeholders. Despite extensive research on wetland ecology and management, there are still significant knowledge gaps regarding the

complex spatial and temporal dynamics of these systems (Tecklie & Yosef, 2022). Addressing these gaps through targeted research and monitoring efforts is essential for improving the scientific foundation for wetland management and decision-making

### 2.3. Land use/ land Cover change of greater Mubende since 1990-2015

According to Galandi, Nabannoga et al., (2022), it was recorded that there has been land use land cover change over the last three and half decades (1990-2025). This has also reduced wetland cover in the study area as shown in the attached maps of the greater Mubende in the cattle corridor.

As of 2020, agriculture and natural forest are the dominant land uses in Mubende district, followed by grassland and other categories. However, studies indicate a significant increase in agricultural and urban areas at the expense of forests, wetlands, and grasslands over time

Based on data from Global Forest Watch and other studies, the primary land cover types in Mubende district are:

- **Natural Forest:** Covers 17% of the district's land area, or 103 kha.

- **Non-natural tree cover:**

This includes plantations and makes up an additional 1.3%, or 7.86 kha.

- **Other land cover:** This category accounts for the remaining 509 kha.

#### 2.3.1. Land use/cover trends (1992–2020)

Several studies highlight the dramatic shift in land use over the last few decades, largely driven by population growth and agriculture.

- **Increase in agriculture:** One study focusing on Western Uganda (which includes Mubende) found that agricultural area increased significantly between 1992 and 2020, expanding by 2254.95% in one sub-catchment.

This indicates that farming for crops like maize is the leading cause of deforestation.

•**Declining forests:** The district has seen a major loss of forest cover, driven by the expansion of agricultural land and charcoal production. One study found a 70.75% decrease in forest area within a sub-catchment from 1990 to 2020. Another report noted that Mubende experienced a 79% deforestation rate by 2005.

•**Shrinking wetlands and grasslands:** Wetlands and grasslands have also been converted to agricultural land. One analysis showed a 41.38% reduction in grassland and a 36.51% reduction in wetlands in the Nabakazi River sub-catchment between 1990 and 2020. Another study across Western Uganda found similar declines in grassland and wetlands between 1992 and 2020.

•**Expanding urban areas:** Urban land cover in the district has grown substantially, as demonstrated by the expansion of Mubende Municipality and other settlements. This development has also contributed to the loss of natural land cover.

### 2.3.2 Wetlands in Mubende

The components of Environment are centered on: Human beings, land soil, water,

wetlands, fish, Animals, insects and other small creations, plants, built up Environment, and socio-economic factors.

The vegetation in Mubende district is vibrant particularly during the wet season. Much vegetation is destroyed during the dry season as a result of wild bush fires. The growing demand for fuel wood and construction materials is gradually causing deforestation in the district.

Mubende district has a total area of 3,198km<sup>2</sup>. The districts have a total area of 358km<sup>2</sup> land under wetlands of which 25km<sup>2</sup> is already converted. The permanent wetlands cover 171.7km<sup>2</sup> while the seasonal wetlands cover 286.4km<sup>2</sup> and of these the papyrus swamps cover approximately 75.5km<sup>2</sup>. Mubende district wetlands lie within the altitude range of 1250-4650ft.

### 2.3.3 Wetland Categories

Mubende district has two broad categories of wetlands, those associated with lakes (locustrine) and rivers (riverine).

Mubende has four main drainage systems and these are Nabakazi, Katonga, Nkusi, Kuzizi. The following are the major wetlands in each major drainage system in Mubende district.

**Table 1: Major Wetlands In Each Major Drainage System In Mubende District**

Drainage System	Major Wetlands
Nkusi	Kwetuna
Kuzizi	Wesikira, Ntolo, Namukya, Namiko, Kanyegera and kaija
Katonga	Kakoko, Namukekemya, Nabijjoka and Kisojjo
Nabakazi	Kattabalanga, mpologoma, lwamagembe, kabala, Kakwale, Bwola, kiiye and Kabolokota.

**Source; District Wetland Inventory**

The riverine type: a few rivers exist, namely, Kisojo, Katabalanga, and Nabakazi among others. Other small rivers are located in the northern part of the district. The Wetlands can further be differentiated based on altitudinal venations. The main valleys are flat-bottomed, frequently aggraded into poorly defined stream channels (valley swamps) and seasonal swamps; minor valleys rarely contain definite stream channels.

Mubende district mainly has permanent and seasonal wetlands. Permanent wetlands have fresh water with emergent reeds and swamps, typically dominated by single reed species. These include;

- a) Papyrus swamps with floating or usually anchored on firm soils of Lake Wamala area. Miscanthus swamps, vossia swamps, (L. Wamala) phragmites swamps evenly distributed and typha swamp are also common.
- b) Fresh water floating leaves but vegetation communities dominated by Nyampaea swamp is also common.
- c) Fresh water surface floating vegetation communities dominated by Pistia stations, lemna (Azolla swamp) and Enchonia

Grassipes are also common especially on slow moving water.

- d) Floated herbaceous wetlands with variable species like Echimochloa panicum rupens, cynodon swamps “teete”) are also common especially in Kasambya and Kigando sub counties, loudetia-cynodon-setenia swamps are also common in Buwekula and Kassandra counties. Seasonally Cyperus wetlands are common.
- e) Seasonally flooded wooded grassland especially around kattabalanga and Nabakazi areas is also common.
- f) Fresh water palustine forests
- g) Permanent swamp forests in Buwekula county still exist and are dominated by Phoenix or Raphia calmus, Ficus (Mivule) and Albizia‘Migavu’ are common.
- h) Seasonal swamp forests dominated by phonex, Sapirm and Ficus. These have been heavily encroached upon for agriculture.
- i) Most areas of Mubende district are dominated by fresh water riverine with Acaacia, Ficus, combretum, phoenix pseudo-spondias erythrina and Alchornea among others as major species.

## 2.4. Legal framework

Uganda's Environmental Legal and Policy Framework represents a comprehensive and dynamic approach to managing and protecting Uganda's diverse ecosystems and natural resources. Anchored by the National Environment Act, Cap181, this framework establishes the National Environment Management Authority (NEMA) as the central body mandated to oversee environmental governance in Uganda. The Act, along with the National Environment Management Policy (1995), integrates environmental considerations into all sectors of national development, reflecting a deep commitment to sustainable development and the preservation of Uganda's biodiversity. These laws and policies address key issues such as pollution control, natural resource management, and climate change mitigation & adaptation, positioning Uganda as a proactive contributor to global environmental conservation efforts. This essay explores the intricacies of Uganda's environmental legislation and policies, examining their effectiveness, challenges, and the critical role they play in shaping the country's sustainable future. It is imperative that we disaggregate the framework as it stands, from the international to the regional and domestic levels.

### 2.4.1. International

#### a) The Ramsar convention on wetlands

The Ramsar convention on wetlands is an intergovernmental treaty adopted on the 2nd February 1971 in the Iranian City of Ramsar. It is the first global intergovernmental treaty which is specific on conservation and wise use of natural resources. The convention initially put emphasis on the conservation and wise use of wetlands primarily to provide habitat for the water/birds but the scope was later broadened to cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation and for the

wellbeing of human communities.

Uganda is a signatory to the Ramsar convention having ratified the convention in 1988 and currently has 12 wetlands designated as Ramsar sites and Nabakazi links /feeds into several sites including Lake George, Lake Nabugabo, Nabajuzi sites. The convention advocates for preparation of management plans for important wetlands and promotion of sustainable utilisation, through the wise use principle.

#### b) The African-Eurasian Water Bird Agreement

This was an agreement developed in 1993 from deliberations of the Bonn Convention. AEWA is another agreement that offers a good opportunity for the management and conservation of wetlands.

The African-Eurasian Migratory Waterbird Agreement (AEWA) is an international treaty focused on the conservation of migratory waterbird species and their wetland habitats across Africa, Europe, the Middle East, Central Asia, and parts of North America. Adopted in 1995 and administered by the United Nations Environment Programme (UNEP), AEWA brings together range states to implement coordinated conservation actions, encompassing species protection, habitat management, research, education, and addressing human activities and climate change impacts.

#### c) Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) was signed by 150 government leaders at the 1992 Rio Earth Summit as a practical tool for translating the principles of Agenda 21 into reality. The Convention recognizes that biological diversity is about more than plants, animals and micro-organisms and their ecosystems; it is about people and our need for food security, medicine, fresh air and water, shelter, and a clean and healthy environment.

It has three main objectives: the conservation of biological diversity; the sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Uganda signed and ratified this convention on 12th June, 1992 and 3 September, 1993 respectively.

d) United Nations Convention to Combat Desertification (UNCCD)

The United Nations Convention to Combat Desertification (UNCCD) is the only international legally binding framework established to address the problem of desertification. There are 197 Parties to the Convention, including 196 country Parties and the European Union. The Convention is predicated on the principles of participation, partnership and decentralization. It embodies the multilateral commitment to mitigate the impact of land degradation, and protect our land so we can provide food, water, shelter and economic opportunity to all people. The Convention unites governments, scientists, policymakers, the private sector and communities around a shared vision to restore and manage the world's land. This work is crucial to ensure the sustainability of the planet and the prosperity of future generations. Uganda ratified this convention on 25th June, 1997.

e) **United Nations Framework Convention on Climate Change (UNFCCC)**

The United Nations Framework Convention on Climate Change (UNFCCC) is the UN process for negotiating a consensus to limit climate change. It is an international treaty among countries to combat dangerous human interference with the climate system through limiting the increase in greenhouse gases in the atmosphere. It was signed in 1992 by 154 states at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro. The convention's main objective is explained in Article 2. It is the

“stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [i.e., human-caused] interference with the climate system”. The treaty calls for continuing scientific research into the climate. This research supports meetings and negotiations to lead to agreements. The aim is to allow ecosystems to adapt to climate change. At the same time it aims to ensure there are no threats to food production from climate change or measures to address it. And it aims to enable economic development to proceed in a sustainable manner. The UNFCCC's work currently focuses on implementing the Paris Agreement. This agreement entered into force in 2016. It aims to limit the rise in global temperature to well below 2 °C (3.6 °F) above levels before the Industrial Revolution, and even aiming to hold it at 1.5 °C (2.7 °F). The Paris Agreement superseded the UNFCCC's Kyoto Protocol which had been signed in 1997 and ran from 2005 to 2020. By 2022, the UNFCCC had 198 parties. Its supreme decision-making body, the Conference of the Parties (COP), meets annually. Other meetings at the regional and technical level take place throughout the year, notable among which are the meetings of the Subsidiary Bodies, that is; the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI). Uganda ratified the UNFCCC in 1994, the Kyoto Protocol in 2004 and the Paris Agreement in 2016.

f) UNEP Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal.

The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal was adopted on 22nd March, 1989, by the Conference of Plenipotentiaries in Basel -Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world, of deposits

of toxic wastes imported from abroad. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” – household waste and incinerator ash.

### **g) Nile Basin Cooperative Framework Agreement (CFA)**

The Nile Basin Cooperative Framework Agreement (CFA) outlines principles, rights and obligations for cooperative management and development of the Nile Basin water resources. As a diametrical shift to quantifying ‘equitable rights’ or water use allocations, the Agreement aims at establishing a framework to promote integrated management, sustainable development, and harmonious utilization of the water resources of the Basin, as well as their conservation and protection for the benefit of present and future generations. For this purpose, the Agreement envisages the establishment of a permanent institutional mechanism, the Nile River Basin Commission (NRBC) which would serve to promote and facilitate the implementation of the CFA and to facilitate cooperation among the Nile Basin States in the conservation, management and development of the Nile River Basin and its waters. Uganda ratified the Nile Basin Cooperative Framework Agreement (CFA) on 14th May, 2010.

## **2.4.2. Regional**

a) African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032).

The African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032) supports the realization of the African Union Agenda 2063 by set-

ting out principles, priorities and action areas for enhanced climate cooperation and long term, climate resilient development. The Strategy provides an outline for harmonized and coordinated actions to respond to the impacts of climate change, thereby supporting planning for the continent’s low-emission future. The Strategy defines the main parameters and priorities in building African resilient capacities for adaptation and exploiting the benefits of the mitigation potential of the continent. It seeks to ensure that institutions, strategies, and decisions for climate risk management and climate-resilient development are integrated and implemented as a central aspect of achieving sustainable development, as framed by Agenda 2063 and the United Nations’ Agenda 2030.

### **b) East African Climate Change Policy, 2011**

The East African Climate Change Policy, 2011 was as result of a directive by the Heads of State of the East African Community (EAC) to the EAC Secretariat to develop a Climate Change Policy and strategies to address the adverse impacts of climate change in the region and harness any potential opportunities posed by climate change within the principle of sustainable development. The overall objective of the EAC Climate Change Policy is to guide Partner States and other stakeholders on the preparation and implementation of collective measures to address Climate Change in the region while ensuring sustainable social and economic development. The Policy prescribes statements and actions to guide climate change adaptation and mitigation to reduce the vulnerability of the region and enhance adaptive capacity and build socio-economic resilience of vulnerable populations and ecosystems. The Policy is founded on three key pillars, namely, adaptation, mitigation and climate change research (monitoring, detection, attribution and prediction).

### 2.4.3. Domestic

a) The Constitution of the Republic of Uganda, 1995

The Constitution is the supreme law/ grand norm of Uganda. The 1995 Constitution was promulgated on 8th October, 1995. It is Uganda's fourth constitution since independence in 1962. The 1995 Constitution established Uganda as a republic with executive, legislative, and judicial arms. The roles and powers of each of the Government arms are enshrined and spelt out in the Uganda Constitution 1995. This Constitution has been amended twice since its promulgation; in 2005 and in 2017.

#### b) National Environment Act, Cap 181

The National Environment Act, Cap 181 was enacted in 2019 with the aim of; repealing, replacing and reforming the law relating to environmental management in Uganda; to provide for the management of the environment for sustainable development; to continue the National Environment Management Authority as a coordinating, monitoring, regulatory and supervisory body for all activities relating to environment; to provide for emerging environmental issues including climate change, the management of hazardous chemicals and biodiversity offsets; to provide for strategic environmental assessment; to address environmental concerns arising out of petroleum activities and midstream operations; to provide for the management of plastics and plastic products; to establish the Environmental Protection Force; to provide for enhanced penalties for offences under the Act; to provide for procedural and administrative matter and any ancillary matters.

#### c) National Climate Change Act, Cap 182

National Climate Change Act, Cap 182 was enacted in 2021 to give the force of law in Uganda to the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement; to provide for climate change response measures; to provide for participation in climate change

mechanisms; to provide for measuring of emissions, reporting and verification of information; to provide for institutional arrangements for coordinating and implementing climate change response measures; to provide for financing for climate change; and for ancillary matters.

#### d) National Forestry and Tree Planting Act, Cap 160

The National Forestry and Tree Planting Act, Cap 160 was enacted in 2003 to provide for the conservation, sustainable management and development of forests for the benefit of the people of Uganda; to provide for the declaration of forest reserves for purposes of protection and production of forests and forest produce; to provide for the sustainable use of forest resources and the enhancement of the productive capacity of forests; to provide for the promotion of tree planting; to consolidate the law relating to the forest sector and trade in forest produce; to establish a National Forestry Authority; to repeal the Forests Act, Cap. 246 and the Timber (Export) Act Cap. 247; and to provide for related matters.

#### e) The Land Act, Cap. 236

The Land Act, Cap. 236 was enacted in 1998 to provide for the tenure, ownership and management of land; to amend and consolidate the law relating to tenure, ownership and management of land; and to provide for other related or incidental matters.

#### f) Water Act, Cap. 164

The Water Act, Cap. 164 was enacted in 1997 to provide for the use, protection and management of water resources and supply; to provide for the constitution of water and sewerage authorities; and to facilitate the devolution of water supply and sewerage undertakings.

**g) National Wetlands Policy, 1995**

National Policy for the Conservation and Management of Wetland Resources, 1995 aims at curtailing the rampant loss of wetland resources and ensuring that benefits from wetlands are sustainable and equitably distributed to all people in Uganda. The wetlands policy calls for; no drainage of wetlands unless more important environmental management requirements supersede; sustainable use to ensure that benefits of wetlands are maintained for the foreseeable future; environmentally sound management of wetlands to ensure that other aspects of the environment are not adversely affected; equitable distribution of wetland benefits and the application of environmental impact assessment procedures on all activities to be carried out in a wetland to ensure that wetland development is well planned and managed.

**h) National Energy Policy, 2023**

The Revised Energy Policy for Uganda, 2023 (EP2023), replaced the Energy Policy for Uganda 2002, and is aimed at building on the achievements made in the sector and to address; the need for increased

energy supply and access to Uganda's fast-growing population and industrialization, emerging trends and technologies in the energy sector, energy demand requirements and utilization in a sustainable manner.

**j) Disaster Preparedness and Management Policy, 2010**

The overall policy goal of the Disaster Preparedness and Management Policy, 2010 is to promote national vulnerability assessment, risk mitigation, disaster prevention, preparedness, effective response and recovery in a manner that integrates disaster risk management with development planning and programming. The policy aims at building the capacity of Ugandans to minimize serious social and economic disruptions as a result of disaster events.

**k) Environment and Social Safeguards Policy, 2018**

The Environment and Social Safeguards (ESS) Policy Framework was adopted to ensure that, in implementing development programs, positive social impacts are maximized while negative ones are minimized or avoided.

**3.0. METHODOLOGY****3.1. Methods used****3.1.1. Introduction**

This sections details how the primary data was collected from the study area along the Nabakazi Wetland Ecosystem. Prior to the survey an engagement meeting was conducted with the District officials where the team requested for an introductory letter to the community to ease the work while on ground (Annex 1)

The following are the detailed descriptions of the methods used in the study.

**3.2. Focus group discussion.**

This was carried and the main target persons were Sub County chiefs and mem-

bers of the lower LC and communities neighbouring R. Nabakazi Ecosystem. A pre-tested interview guide was used at every stage of discussion; whether at group level or at family level (See Annex 2). The names of the respondents were recorded for future interactions to help the project implementation.

**3.3. Transect walk**

This was a standard approach to help the team ascertain the gravity of degradation in the target sub counties. The standard transect was approximately 3-4 kms depending on the ease of accessing the land along the wetland. The parameters sought

out were: level of degradation, estimated from the current edge of the wetland to a distance estimated to be where the edge of the encroached wetland would have been. Evidence of verification were photographs and presence or absence of boundary concrete mark-stones and or other agreed boundary markers.

### 3.3.1. Opportunistic observation on wild animals encountered

This was carried during the transect walk. This was done through listening to bird calls, observing birds fly by; observing the edge of the swamp for primates and inquiring from members of local communities guiding the team along the transect. Where possible pictures of such animals were taken.

### 3.3.2 Homestead visits and interviews

This went hand in hand with other methods applied during the transect walk. Homesteads were visited, heads of household where present were interviewed or any member found at home during the stay of the consultants. The guided interviews focused on the “how they use wetland, what to do about restoring the some of the degraded part, especially the buffer area, would the family be willing to work in collaboration with the stakeholders / project promote wise use for protection of the wetland, what indigenous beneficial tree species would be preferred for planting in such an area that improve livelihoods and environmental conservation”



*Plate 2: Some of the respondents in Bwakago area, adjacent to Nabakazi wetland Ecosystem in Kalonga Sub- County*

### 3.3.3. Key conservation practitioners in the study area.

The team visited a number of farmers of maize and coffee and also large farms like Kaweeri coffee plantation.

### 3.3.4. Community Engagement

The consultants used transect walk along the wetland fringes to engage members of the community who were found engaged in their day today activities in the ordinary setting. This setting allowed the consultant to find a relaxed engagement where the answers grounded in reality.

### 3.4. Identification of suitable species for restoration.

Identification of suitable species for restoration within the buffer zone with identifiable economic purposes/ values. Community members were interviewed regarding this aspect. Obtained answers were further teased out to ascertain their perceived value to the community members. Values hinged around the tree species contribution to people's nutrition, fodder, commercial uses and marketability, tree perceived lifespan, ease of propagation and possible value addition, indigenous or not, common or not in the community. Whenever opportunity presented itself, the tree species were seen, to make sure that the communities and the consultants had the same idea of the tree species.

### 3.5. Wildlife/ Animals Species occurrence in Nabakazi Wetland Ecosystem

Opportunistic Observations of the wild animals that are found here were made during the transect walks. The aspects concentrated on were: Calls / noise heard made animals, flypast in case of birds, animal flashing or movement in the nearby bush or part of the wetland; and inquiring from the local community members about the existence of identifiable species using local names which would be cross-checked with identification wild animal manual guides. A record the species is attached for ease of reference.

### 3.6. Spiritual mythical areas

As part of the inquiry, members of the community met along the transect routes, and accepted to participate in the survey, gave highlights of what was considered to be mythical and or spiritual. These were cross checked with other community members met along the transect. Records of such areas available in the findings.

### 3.7. Review of secondary data

A number of documents were reviewed to include the Katoga Catchment management plan, the District state of environment report, the District Development plan and Natural resources quarterly and annual reports.

## 4.0 FINDINGS/RESULTS

### 4.1. Introduction

This section looks at what was found in the field and also the information gathered through the various reviews of documents. It covers findings from the five sub-counties that were surveyed namely Madudu, Kigando, Kitenga, Kalonga and Kayebe. A total number of 184 house hold heads were interviewed, mainly on site where degradation has taken place. About 112 are land lords, the rest are tenants. The general

trend was that most severe encroachment were in Madudu in the villages of Nabakazi, Kagunguri, Ruraka and Bwiginiro. Kalonga, in villages of Bwakago, Kitenga in Kibuyevuuga and Rwabagoma. Kayebe and Kigando livelihoods activities are largely derived from cattle keeping. On the other hand, the most encroachment areas are where crop farming is practiced most, than in livestock areas. In addition, a social

economic survey undertaken to identify the profile of the study area that determines the main drivers in Nabakazi encroachment. More details follow in the sections below.

**4.2. Results of the field assessment to identify potential sites for restoration**

Assessment of the buffer areas of the Nabakazi wetland Ecosystem in Mubende District was undertaken using several methods as indicated in section 3 above. The following are iterations of how the areas were arrived at.

**4.2.1. Human and livestock population demographics in areas visited**

The Nabakazi and adjacent areas are inhabited by diverse ethnic groups. Those encountered during the survey include: Baganda, Banyoro, Batooro Bakiga, Banyankole, Banyarwanda and Bafumbira were among those interviewed. The diverse ethnic groups were seen to practice diverse economic and social practices. These have resulted into land use changes in the areas inhabited by such communities. Communities in Madudu, Kalonga and Kitenga sub counties cultivated the wetland buffer and planted crops particularly, sweet potatoes, Maize, Yams, coffee bananas and sugar cane. While in Kigando and Kayebe the

predominant activity is largely Livestock farming (cows and goats) which are kept at subsistence and commercial levels. It is important to note that EACOP oil pipeline crosses Nabakazi wetland Ecosystem in Kitenga Sub County and is likely to impact community livelihoods and environment.

The bad farming practices observed led to degradation in many parts of the study area.

In areas where benefits were derived from the wetland were being used various ways to include; irrigation, watering of livestock and water for domestic water, crop farming with coffee and maize being the dominant crops. Conservation was seen to be done. For example, in Kigando, cattle keeper preserved the wetland and only accessed it for watering their animals.

It was observed that in the sub counties of Madudu and Kalonga there was more agricultural farming while Kayebe, kitenga and Kigando were more of cattle keepers. In regard to this agricultural expansion was seen to be the most detrimental to the ecosystem.

**4.2.2. Potential Restoration areas**

These were identified during the study, where the local people were the guides. The table below shows the potential sites identified.

*Table 2: Identified degraded sites along Nabakazi Wetland Ecosystem, Mubende District*

No.	Name of the site/ Village	sub county	No.	Name of the site/ Village	Sub county
1	Nabakazi	Madudu	13	Lwabagoma	Kitenga
2	Kagunguri	Madudu	14	Bushwabwera	Kitenga
3	Ruraka	Madudu	15	Gogonya	Kitenga
4	Bwiginiro	Madudu	16	Butayonja	Kayebe
5	Bwakago	Kalonga	17	Butawata	Kitenga
6	Rwensambya	Kalonga	18	Kiryamenvu	Kitenga
7	Kyabagamba	Kalonga	19	Kawadura	Kitenga
8	Misenda	Kalonga	20	Butayunja	Kitenga
9	Kibati	Kalonga	21	Kibuyevuuga	Kayebe
10	Kawadusa	Kigando	22	Kyabalanzi	Kayebe
11	Katabalanga	Kigando			
12	Butawata	Kigando			

The study found that the need for Land for Agriculture, water for Irrigation and watering livestock contribute significantly to wetland degradation. This is due to the fact that Mubende is prone to drought and thus communities tend settle in low lands which are suitable for crop farming in all seasons. In Madudu Sub County, where the terrain is hilly, most communities find refuge in valleys where suitable Arable land is found which also happens to be swamps.

#### 4.2.3 Local livelihoods derived from wetland

A big number of community respondents (85%) reported that they depended on Nabakazi Wetland Ecosystem for part of their income and livelihood demands. The common wetland products reported to contribute to the livelihoods included water; fish; medicine; raw materials for crafts; raw materials for construction; vegetables and fruits; clay and sand for construction.



*Plate 3: Water supply reservoir and pump located at Kaala village in Kalonga Sub- County on Nabakazi wetland Ecosystem*

#### 4.2.4 Community engagement on restoration of Nabakazi Wetland Ecosystem

The study found out that the communities were willing to adhere to the recommended 30 metre buffer zone protection equivalent to 100 feet. All the respondents interviewed reported that they supported development and implementation of relevant policies and legislations that relate to sustainable use of Nabakazi Wetland Ecosystem. However, some of the community members showed a lack of awareness of the current policies and regulations that govern wetland management. They thus requested for more

sensitisation and awareness.

During the interactions and observations in the field it was found out that the biggest threats and pressures to conservation efforts included;

- Existing land ownership, which had previously led to precedents where people neighbouring wetlands would claim an assumed ownership of adjacent wetland sections next to the community's areas.
- Unclear Boundary markers, which tempt neighbouring land owners to encroach on wetlands.

- Removal of boundary markers, which leaves an unclear guidance on the wetland and buffer zone boundary.
- Local village environment conditions provide precedents that make people refer to situations where Government has allowed wetland use, most of which are in public domain.

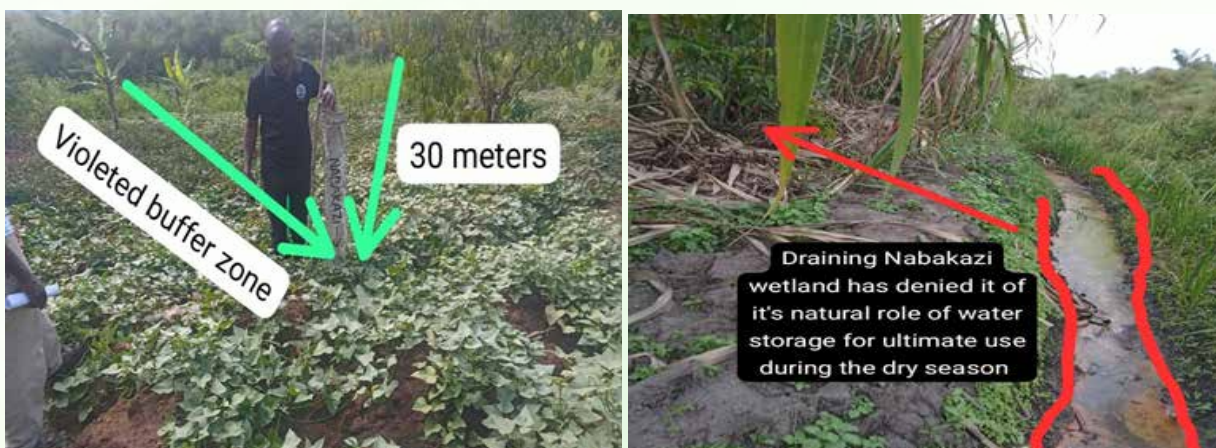
The survey found out a number of respondents in the host communities had reservations on policy guidance on how to use the wetland and they seem to have only received harsh directives and suggested that they be involved in the Nabakazi Wetland Ecosystem conservation and suitable use. They were willing to participate in protection to a level of putting in place arrangements to punish those who degraded the wetland. This is in line with the Ramsar conservation principle of wise use and Uganda’s environmental act as well the constitution of the republic of Uganda 1995.

Respondents proposed that an arrangement be made to bring on table all wetland beneficiaries in different areas to provide background information on different benefits they get from the wetland and propose ways to sustain these benefits without compromising the ecosystem functions of the wetland and its connectivity. The communities and their leadership confirmed that it was easy to arrange under the Parish Development Model (PDM) and would enhance conservation of the wetland.

They appreciated that if they were convened, they would build consensus on the way forward on adherence to government policies that support benefits derived from the wetland use such as water-supply, crafts materials harvesting, fishing and fish farming. Suggestions from the communities are in line with government and Ramsar convention good practices of community-based wetland management planning.

**4.2.5. Encroachment on Nabakazi Wetland Ecosystem for agriculture, settlement expansion and urban edge farming.**

The Nabakazi Wetland has experienced a lot of degradation as result of quest for land for agriculture, settlement expansion and urban edge farming. In recognition of the degradation, Mubende District Local Government organized a wetland boundary opening and demarcation exercise. The boundaries were demarcated with concrete Pillars in some areas. During the Nabakazi Wetland Ecosystem baseline survey, a follow up was made to check on the status of the boundary demarcation pillars. Although some pillars were still in place, some had been uprooted and/ or thrown away. In some areas, owners of the land neighbouring demarcated areas complained that due to heavy floods, the flood zones had expanded into their land. In some areas the district put mark stones but communities still cultivate beyond them into the buffer zone. In other areas flooding has gone beyond the mark stones into what communities claim was their land blaming “water and the wetland failing to observe the mark-stones”.



*Plate 4: Concrete pillars Vs. Draining wetland for establishment of Gardens in Kaala village, Kalonga Sub County*



*Plate 5: Chairman LC III Kitenga standing near a pillar installed by the district*



*Plate 6: Growing of maize touching wetland leads to wetland siltation, Buswabwera village, Kitenga Sub County*

#### 4.2.6. Pollution sources

One common source of pollution reported by most respondents was the increased use of agro-chemicals, which is worsened by lack of technical guidance on use and safe disposal of the used chemicals. The respondents were more worried by the fact that most of the population collect water for

cooking from open wells where the dangerous agrochemicals are washed from gardens to water source. Respondents also reported that there is poor waste water management from different homesteads. The respondents proposed that Government should put in place measures to guide local communities on effluent discharge.



*Plate 7: Plastic Pollution in the catchment*

#### 4.2.7 Tree species likely to impact wetland ecosystem services

During the survey, there were big swaths of land on which pine and eucalyptus are found. Eucalyptus, according to literature, each mature tree of Eucalyptus uses water in the range of 40-200litres per day. As such this puts extra strain on water in the wetland ecosystem, including drying them up. Thus, the consultants are of the view /opinion that eucalyptus should not be encouraged anymore near wetland and water storage areas.



*Plate 8: Eucalyptus trees planted in the catchment and buffer zone*

#### 4.2.8. Suitable species for restoration

The communities indicated that fruit trees such as avocados, jack fruit trees, mangoes would be the right species to plant as they would be better for both environmental conservation and improved community livelihoods. The planting of trees like *Ficus natalensis* would also work in case of apiary and back cloth material harvesting. In areas where the landscape is at steep slope, terracing would be the best intervention to guard against soil erosion and siltation of the wetland. Annex 4 provides an extended checklist of fruit trees with a potential to be planted in the buffer zone.



*Plate 9: Jackfruit tree recommended for restoration and buffer zone for livelihoods improvement and conservation, Kaala Village, Kalonga*

#### 4.2.9. Wildlife animals recorded during the survey,

Wild animals found along the stretch of Nabakazi wetland Ecosystem were:

**Birds:** The Bird species encountered included **Crowned Cranes** but not frequently seen because of the degraded wetland. The local population mentioned these were fewer in appearance. Other birds were **Ross Turaco, Black and White casket Hornbills, woodland kingfisher, Black and white crows, Common Heron, Lesser Cattle egret, Weaver birds**, all found in the remaining riverine forest patches in Madudu and Kalonga sub-counties:



*Plate 10: The crowned cranes in gardens since their habitat has been encroached*

The most common wild/mammals in the study area were vervet monkeys that were seen in papyrus swamps in Madudu, Bwiginiro village. On further inquiry from the members of the local community found at the visited locations, the consultants were informed of the presence of Black and white colobus monkeys.

Other wild animals known to exist here were: Bushbuck in Kalonga, sitatunga with

wide distribution; In Kitenga, there were occasional visits of Hippopotamus, especially during heavy rains and when it floods.

These wild animals pose a special challenge to local population as some of them raid the crops particularly maize, beans, bananas, and passion fruit. Hippopotamus posing a big danger to people living close to Nabakazi wetland Ecosystem



*Plate 11: Wet moat (a trench filled with water) to stop vervet monkeys from crossing to raid crops in Kabweyakiza village, Madudu sub county*

It is important to note that riverine forests have been degraded whose existence is marked by the presence of trees such as: Acacia hockii, Palm trees, Erythrina Abyssinica Indigenous riverine trees: Acacia hockii, Palm trees, Erythrina Abyssinica, Acacia elatior  
Acacia nilotica Acacia sieberiana Albizia coriaria, Albizia grandibracteata Albizia gummifera.

#### **4.2.10: Growing coffee as conservation trees**

It is important to note that communities are growing coffee in the areas neighbouring buffer zone(s). The interviewed communities told researchers that the coffee trees could perennially lead to the conservation of the wetlands. However, the coffee trees should be grown above the buffer zone line above 30 metres.

During the study, Kaweri coffee plantation was identified for the best conservation practices which has a number of lessons which should be taken note of and could be replicated. Some of the main take home points to note from Kaweri Management are:

- They are subjected to annual environment audits by NEMA
- They are cognisant of the climate unpredictability hence practice climate enhancement interventions
- The work and collaborate with out growers who comply with Ibero Standards, one of which Pillar is on Nature conservation requiring farmers not cutting trees and maintaining 50% shade cover for carbon sequestration
- Farmers are in associations called polygons which are monitored for purpose complying with standards
- Sales of coffee are on the strength of traceability, which attracts a higher price to the farmers



Suggestions by Kaweri Management regarding their contribution to Nabakazi Wetland Ecosystem management were;

- Contacts of landlords/coffee farmers should be available especially where they border the plantation.
- Training should be targeting mind-set change
- Training to start on small scale in benchmarking with farmers of their size but better sustainable land use practices and quality management
- Conduct a baseline of coffee farmers with a possibility to identify candidates that can measure up to “establishing a Demonstration farm”
- Farmers should be willing adopt agro-forestry practices
- Apiary can be an added practice and advantage for the farmers and can serve as a motivation as this will multiply pollinating agents.



*Plate 12: Kaweri Coffee Estate plants*

### 4.3. Gender Issues

During the study, very few women and youth were found to own land. This is likely to limit the participation of women and youth in decision-making of wetland conservation. However, they were found to participate under the auspices of the parents and husbands. Some of the respondents were found to have been partic-

ipating in parish development model programs. Parish Development Model (PDM) is a presidential directive aimed at improving people’s household incomes. Thus, it is a good opportunity for the NAPE programme to synergise with and enhance wetland conservation while backed by the presidential directive on wetland conservation.

It is important to note here that, the current status of wetland resource access does not cater for the weak, disabled, elderly, the sick and children as they have to travel long distances, to access them. This makes insecure especially for girls and women. This thus called for the need to develop the water sources that were identified along Nabakazi Wetland Ecosystem and also extend other services and skills such as home energy saving sources such as stoves and venturing into green energy, provision of animal feeds closer to vulnerable homesteads as well encouraging boundary planting and establishment of woodlots in their vicinity.



*Plate 13: A girl fetching water at the peripheral of Nabakazi wetland Ecosystem*

Nabakazi wetland Ecosystem suffers from “Tragedy of the commons” where access is not effectively regulated and its exploitation leads to degradation. The women and youth take advantage of this while utilising it through cultivation, fetching firewood, collect water, in order to provide for their families. All these are a big driver to wetland encroachment.

#### **4.4 Civil Society Organisations working in Mubende**

Some of the CSOs working in Mubende District include: Uganda Land care Network, Abagahe Apiary Women Group, Community Care Uganda and Nexus Green for water and conservation. NAPE can leverage with these organisations.

#### **4.5. Consultation with neighbouring Districts of Kassanda and Gomba**

Whereas most of the community consultations were carried in Mubende District around the R. Nabakazi Ecosystem, consultation with the technical officers of Gomba and Kassanda Districts, which also host part of R. Nabakazi Ecosystem, who are willing to carry out a similar exercise, but are limited by financial resources. This was borne out by the officers who participated in the validation workshop on invitation, who confirmed the need for such an intervention.

Some of the issues identified during a discussion included: Lack of wetland demarcation; there is also undefined apparent wetland degradation. The research found out that while there are formidable suggested interventions for the conservation

and restoration of R. Nabakazi Ecosystem in Mubende, the wetland faces equally the same degradation in the Kassanda and Gomba districts.

This study therefore, suggests that comprehensive research be conducted to inform the needed interventions aimed at saving

the mighty Nabakazi from complete destruction in the Gomba and Kassanda. The research further suggests that Nabakazi is not a standalone wetland, there are several wetland and riverine forests connected to it but were since degraded and therefore similar interventions should be applied to avoid climate change catastrophe in the near future.



*Plate 14: Captured degradation of Nabakazi wetland Ecosystem in Gomba District, Kyabagamba village*

**4.6 Mythical areas, communal resources along Nabakazi Wetland Ecosystem in Mubende District**

Mythical areas identified along the Nabakazi Wetland Ecosystem with the help of local communities include but not limited to the following:

- i. Kabweya lake (Akayanja) Permanent water point which never dries with unknown depth.

- ii. Nalongo Spring with 2 outlets; one salty and the other one is not salty.
- iii. Nabakazi Tree which sometimes falls and stands up on its own Lwabagoma has a traditional site where sacrifices are offered at the fringes of the wetland.

## Summary of Baseline study on Potential sites for Afforestation, Reforestation, and restoration along. Nabakazi Wetland Ecosystem in Mubende District.

Table 3: Potential sites for Afforestation, Reforestation, and restoration along. Nabakazi Wetland Ecosystem.

Sub-country	Land ownership in assessed;	Willingness for joint effort	land use	Crops grown/Live stock	Conservation status Wild animals and Trees present	Drivers of Wetland Degradation /Incentives Priorities for wise use	Suggested interventions	Nonstate actors
<b>Madudu</b>	Absentee landlord with Tenants mostly leases and freehold	Land lord willing to participate in restoration	More than 80% crop farming other areas devoted to livestock farming: cows, pigery, goats;	Sweet potatoes, Beans, Cassava, Maize, Bananas, ground nuts etc. Cash crops include coffee intercropped with Bananas,	Wetland Heavily encroached to the stream edges; Crowned cranes observed; sitatunga reported to be present; Vervet monkeys and Black and white colobus monkey; Indigenous riverine trees: <i>Acacia hockii</i> , <i>Palm trees</i> , <i>Erythrina Abyssinica</i> , <i>Acacia elator</i> , <i>Acacia nilotica</i> , <i>Acacia sieberiana</i> , <i>Albizia coriaria</i> , <i>Albizia grandibracteata</i> , <i>Albizia gummifera</i>	Land for Agriculture, water for Irrigation and watering livestock	Water retention facilities for Irrigation and watering of livestock; Extension of water to communities; water use committees to be formed; Wetland demarcation; Restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration site	Local communities' initiatives working together; Faith based institutional development groups; PDM officers in place mobilizing communities as an entry point
<b>Kigando</b>	Freehold and Mailo ownership; Landlords present; leases in a few areas	Land lords willing to participate in wetland conservation	Mixed farming of livestock and crop farming: more than 70% cow	Cattle farming is the most prominent; goats and sheep;	Wetland fairly conserved with intact demarcation concrete pillars. Crowned cranes observed; sitatunga reported to be present; Vervet monkeys and Black and white colobus	Land for Agriculture, water for Irrigation and watering livestock	Water retention facilities for Irrigation and watering of livestock; Extension of water to communities; water use committees to be formed; Wetland	Local communities' initiatives working together; Faith based institutional

			rearing; Goats; Maize growing; Bananas	bananas; Apiary	monkeys Indigenous riverine trees: Acacia hockii, Palm trees, Erythrina Abyssinica Acacia elatior Acacia nilotica Acacia sieberiana Albizia coriaria Albizia grandibracteata Albizia gummifera	Mulching, fodder for livestock,	demarcation; Restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration site	development groups; PDM officers in place mobilizing communities as an entry point
<b>Kienga</b>	Freehold and Mailo ownership; Some Landlords present; leases in a few areas	Some of Land lords willing to participate in conservation	Mixed farming of livestock and crop farming: more than 70% devoted crop farming	The most prominent crop is coffee sweet potatoes, Beans, Cassava, Maize, Bananas, ground nuts; Livestock here is mainly comprised of: piggery, goats, chicken and ducks	Wild animals present here: Vervet monkeys, Black and white colobus monkeys, Bushbuck, sitatunga, crowned crane, fish eagles, Indigenous riverine trees: <i>Acacia hockii</i> , <i>Palm trees</i> , <i>Erythrina Abyssinica</i> <i>Erythrina Abyssinica</i> <i>Acacia elatior</i> <i>Acacia nilotica</i> <i>Acacia sieberiana</i> <i>Albizia coriaria</i> <i>Albizia grandibracteata</i> <i>Albizia gummifera</i>	Land for Agriculture, water for Irrigation and watering livestock Mulching, fodder for livestock	Water retention facilities for Irrigation and watering of livestock, Extension of water to communities; water use committees to be formed; Wetland demarcation; Restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration site	Local communities' initiatives working together; Faith based institutional development groups; PDM officers in place mobilizing communities as an entry point
<b>Kalonga</b>	Freehold and Mailo ownership; Some Landlords	Some of Land lords willing to participate in	Mixed farming of livestock and crop farming:	The most prominent crop is coffee Sweet	Wild animals present here: Vervet monkeys, Black and white colobus monkeys, Bushbuck, sitatunga, crowned crane,	Land for Agriculture, water for Irrigation and	Water retention facilities for Irrigation and watering of livestock, Extension of water to communities;	Local communities' initiatives working together; Faith

	present; leases in a few areas	wetland conservation	more than 70% devoted crop farming	potatoes, Beans, Cassava, Maize, Bananas, ground nuts; Livestock here is mainly comprised of: piggy, goats, chicken and ducks	fish eagles; Indigenous riverine trees: <i>Acacia hockii</i> , <i>Palm trees</i> , <i>Erythrina Abyssinica</i> , <i>Erythrina Abyssinica</i> , <i>Acacia elatior</i>	watering livestock Mulching, fodder for livestock	water use committees to be formed; Infrastructure for Irrigation and watering of livestock, Extension of water to communities; water use committees to be formed; Wetland demarcation; Restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration site	based institutional development groups; PDM officers in place mobilizing communities as an entry point
<b>Kayebe</b>	Freehold and Mailo ownership; Some Landlords present; leases in a few areas	Some of Land lords willing to participate in wetland conservation	Mixed farming of livestock and crop farming: more than 70% devoted crop farming	The most prominent crop is coffee, intercropped with sweet potatoes, Beans, Cassava, Maize, Bananas, ground nuts; Livestock here is mainly comprised	Wild animals present here: Vervet monkeys, Black and white colobus monkeys, Bushbuck, sitatunga, crowned crane, fish eagles Indigenous riverine trees: <i>Acacia hockii</i> , Palm trees, <i>Erythrina Abyssinica</i> , <i>Acacia elatior</i> , <i>Acacia nilotica</i> , <i>Acacia sieberiana</i> , <i>Albizia coriaria</i> , <i>Albizia grandibracteata</i> , <i>Albizia gummifera</i>	Land for Agriculture, water for Irrigation and watering livestock Mulching, fodder for livestock	Water retention facilities for Irrigation and watering of livestock, Extension of water to communities; water use committees to be formed; Wetland demarcation; Restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration site	Local communities' initiatives working together; Faith based institutional development groups; PDM officers in place mobilizing communities as an entry point

				of: piggery, goats, chicken and ducks				
<b>Kiye Wetland / River</b>	Freehold; Malio ownership and Lease	Some of Land lords willing to participate in wetland conservation	Mixed farming of livestock and crop farming: more than 70% devoted crop farming	The most prominent crop is coffee, intercropped with sweet potatoes, Beans, Cassava, Maize, Bananas, ground nuts; Livestock here is mainly comprised of: piggery, goats, chicken and ducks	Wild animals present here: Vervet monkeys, Black and white colobus monkeys, Bushbuck, sitatunga, crowned crane, fish eagles	Land for Agriculture, water for Irrigation and watering livestock	Water retention facilities for Irrigation and watering of livestock, Extension of water to communities; water use committees to be formed. Wetland demarcation; Restoration of degraded sections of wetlands and catchment areas; Set up a Wetland and associated catchment wise use demonstration site##	The Kiye Wetland / River managed by Kaweri Company provided an opportunity for wise use of wetlands and thus provides a good entry for the project

## Demonstration sites establishment will be guided by common land use of wetlands and catchment areas will provide an opportunity for addressing unique cultural settings and crafts

## 5.0. CONCLUSIONS AND RECOMMENDATIONS

### 5.1: Conclusion

The wise use and sustainable management of the wetland resources by lower local structures feeds smoothly into the National Environment Act, which is coordinated by the District Environment office to the Ministry responsible for Environment and Natural Resources (MWE). This also smoothly comes in to fulfil commitments of the Uganda Government to fulfil wetland wise use as outlined in the Ramsar Convention.

Management of Nabakazi wetland Ecosystem is well grounded in the constitution, Local Government Act, NEA and Land Act .

Whereas most of the community consultations were carried in Mubende District around the Nabakazi wetland Ecosystem, consultation with the technical officers of Gomba and Kassanda Districts, which also host part of R. Nabakazi Ecosystem, who are willing to carry out a similar exercise, but are limited by financial resources. This is borne out by the officers who participated in the validation workshop on invitation, who confirmed the need for such an intervention. Some of the issues identified during a discussion included: Lack of wetland demarcation; there is also undefined apparent wetland degradation, Nabakazi wetland Ecosystem in Mubende was found heavily degraded and needs immediate restoration interventions which must involve participation of the communities and lead agencies. This has been emphasized through the issuance of presidential directive on conservation of wetlands country-wide.

Proposed interventions are generic and those specific have been tailored to the particular areas. They include:

- Establishment of Water retention facilities for Irrigation and watering of livestock;
- Extend water to communities in addition to protecting wells which have been identified;

- Form Water committees to manage water use and infrastructure;
- Demarcate wetland using dereferenced positions in erecting pillars while collaborating with the mandated institutions taking the lead;

- Carry out Restoration of degraded sections of wetlands and catchment areas;

- Set up a Wetland and associated catchment wise use demonstration site, consider using an investor for bottling of Nabakazi water and branded as such; promote enterprises that will market and add value to produce from the Nabakazi catchment (such as honey)

- Restoration in the Buffer zone should be planted with fruit and commercial trees that do not adversely affect the hydrological status of the wetland. The trees emphasized are: Jackfruit, Avocado, Pawpaw, coffee, Macadamia, Bamboo and any other that will maintain a balanced environment.

- Growing of fodder such as Elephant Grass (**Pennisetum puparium**), Calliandra, Rhodes Grass and Brachiaria Mulato (for hay and general grazing for large livestock), alfalfa for livestock should be encouraged. Others include improved varieties like Super Napier and Pak Chong which offer high yields and better drought tolerance.

- Growing of Lemon grass and other spices in the buffer areas to earn the local people income to improve on their livelihoods as well as environment conservation

- The degraded land in Madudu and other sites in the Nabakazi wetland Ecosystem should be improved upon using improved agriculture practices such terraces, planting grass bands along the terraces and mulching.

The project should take advantage of existing government opportunities development models especially Parish Development Model (PDM), can be considered an entry points for promoting women and youth activities interventions that can improve wetland conservation. The women were found to cultivating in the wetlands, fetching firewood, collect water, and in general they provide for their families all the time. This a big driver to wetland encroachment.

## 5.2. Recommendations

For gender aspect, it's suggested that provision of easily accessible water supply that saves time that can be used for other income for generating.

There is need to sensitize communities about the likely impacts of the pipeline on community livelihoods and the environment and how to mitigate them at a local level.

Given the many areas that are heavily degraded, the consultant recommend that initial activities geared towards restoration should begin with Kabweyakiza (Bwiginiro) in Madudu sub county Kibuyevuga in Kiteniga and Bwakago in Kalonga sub-counties.

Communities should be provided with telephone contacts of Uganda Wildlife Authority, (UWA) helpline to alert UWA about the presence of the wild animals that are likely to be dangerous. In addition, they should be advised not to kill wildlife (animals) as this contravenes the wildlife act, Cap 2019. It is vital that the people be sensitized about wildlife (Flora and Fauna) in the Nabakazi wetland Ecosystem

- Restoration of degraded sections of wetlands and catchment areas;

- Set up a Wetland and associated catchment wise use demonstration site(s).

- Radio talk-show programs for awareness raising.

- Supplementary enterprises: Apiary; value addition.

- Introduce better farming techniques such terracing, banding based on Climate Smart Agriculture.

- Enterprise development: Apiary, value addition, plant fruit trees and environmentally friendly species; elephant/fodder grass in the buffer spaces

- Protect identified water sources and make them user-friendly to all persons

- Extend water supply to community areas spots to ease access for the vulnerable, disabled and disadvantaged members of society

- Establish kitchen gardens irrigated using water harvesting systems at household level, (gutters and plastic water tank).

- Facilitate and promote energy saving technologies for benefits of: saving women and children time to devote to other economic activities; health of the women in reduction of exposure to excess smoke; saving on the excess use of wetland biomass and other vegetation; contribute emission reduction and contribute to climate change mitigation

- Commission a detailed study on crested crane conservation along the Nabakazi Wetland Ecosystem to cover Mubende, Kassanda and Gomba Districts.

- Explore the possibility of starting a Conservation Investment/ Trust Fund for Nabakazi wetland Ecosystem in the Plans to be carried out.

This study therefore strongly recommends a systematic arrangement where communities in different sub counties adjacent to Nabakazi wetland Ecosystem be brought together based on the different benefits they derive from Nabakazi wetland Ecosystem. The communities will then identify the problems associated with the current

use and come up with friendly approaches aimed at reducing degradation; permitted current uses and for future generations. This process facilitates generation of a community owned/based wetland management plan and commands respect of the communities who are willing to implement it. They suggested they would be available to implement and monitor the success of such a plan which they know benefits their livelihoods and guards them against the problem they get from wetland degradation such floods, water scarcity, food inse-

curity and drought and associated climate change impacts.

This community based respected approach to wetland wise use will be an opportunity to address the sentiments most respondents had “of non-involvement in the directives” that have been underway telling them to leave the wetland. This will address some of the challenges of wetland management observed in some areas where people dismantle wetland demarcation pillars and continuing degradation of the buffer zones.

## 6.0 ANNEXES

### Annex 1: Interview Guide

Dear respondent,

I am, (mention your name and where you come from as well as showing them the introductory letter)

I am /We are conducting research to understand the underlying causes of degradation in R. Nabakazi Ecosystem in Mubende and explore potential restoration strategies. Your community’s insights and experiences are invaluable to this study. The purpose of this questionnaire is to gather information on:

1. Current use and state of Nabakazi Wetland Ecosystem.
2. Perceived causes of degradation
3. Impacts on local ecosystems and communities,
4. Potential restoration and conservation strategies

Your responses will contribute significantly to our understanding of the wetland’s challenges and opportunities. All information provided will be kept confidential and used solely for research purposes.

Thank you for your time and participation.

#### **PART ONE: Personal Information on Respondent**

Name of respondent.....  
 Village.....  
 Parish..... Sub County.....  
 Contact telephone.....

#### **PART TWO: Socio-Economic Characterization**

Age of household head.....  
 Sex of household head.....  
 Marital status.....  
 Main occupation.....  
 (if pastoral attempt to quantify number of livestock) .....  
 Income bracket..... (Weekly, monthly or annual) .....  
 Type of dwelling..... (Permanent, Semi-permanent, Transient) .....

### PART THREE: Wetland Characterisation

Name and Location of Wetland

Name: .....

Location: Sub-county..... Parish .....

Type of Land Ownership (tenure) Land Lord..... Tenant .....

Pristine (intact)	Papyrus	Typha	Swamp forest
Converted	Dairy farming	Crops (horticulture, sugar cane, millet, coffee woodlots)	Fish farming
Restored			
Special category	Traditional fisheries	Ecotourism	Urban water supply

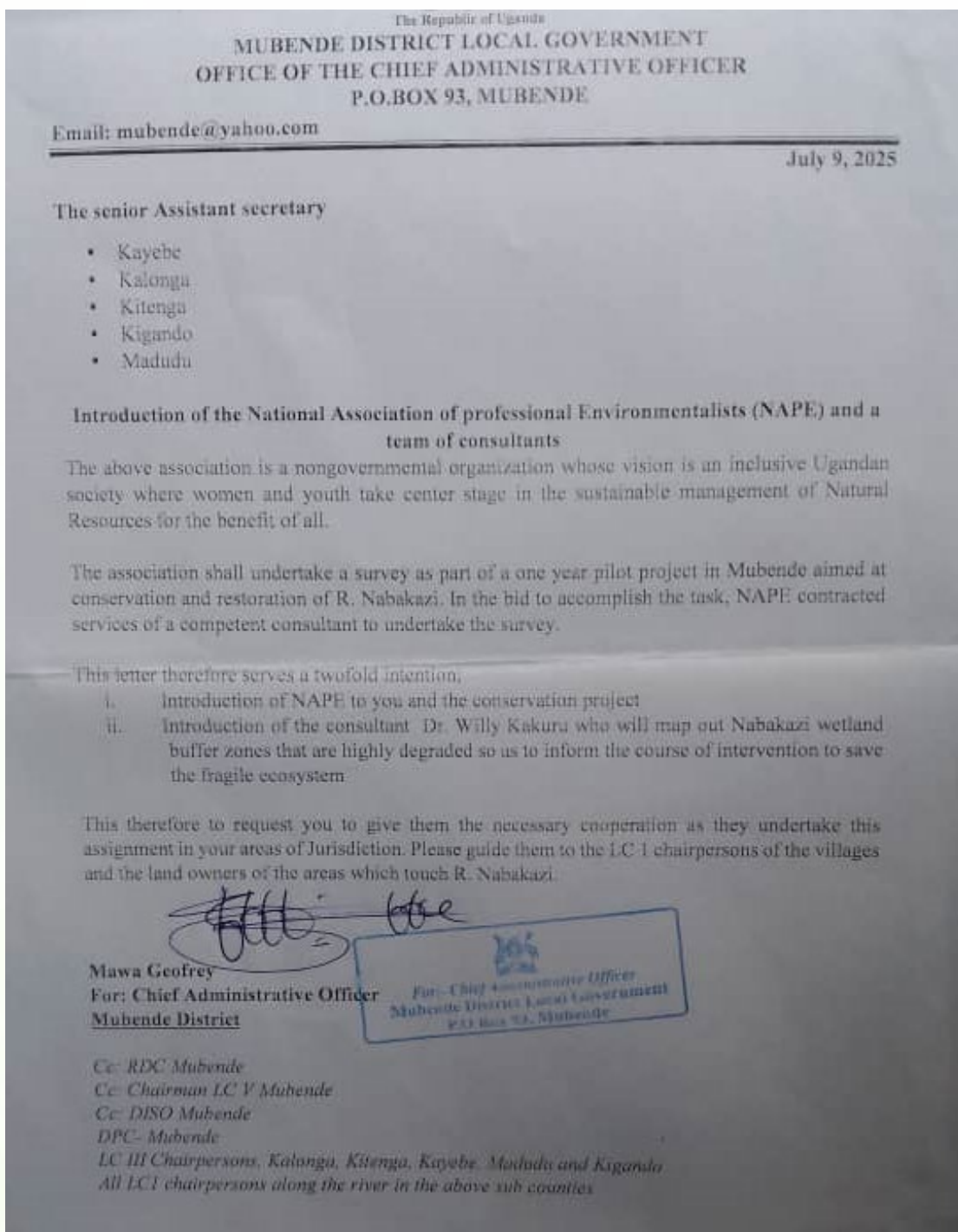
### PART FOUR: Extractive Use of Wetland

Resource extracted	Quantity (volume, weight, head loads)	Domestic use (quantity)	Commercial (quantity)	Price /unit sold	Associated Costs (gross)	Remarks (seasonal variation, regeneration rates, changes in productivity over time)
Papyrus						
Grass (roofing)						
Grass (fodder)						
Grass (mulch)						
Water						
Clay						
Sand						
Stones						
Fish						
Typha						
Medicines						

Honey						
Wild (game) meat						
Firewood						
Other (specify)						

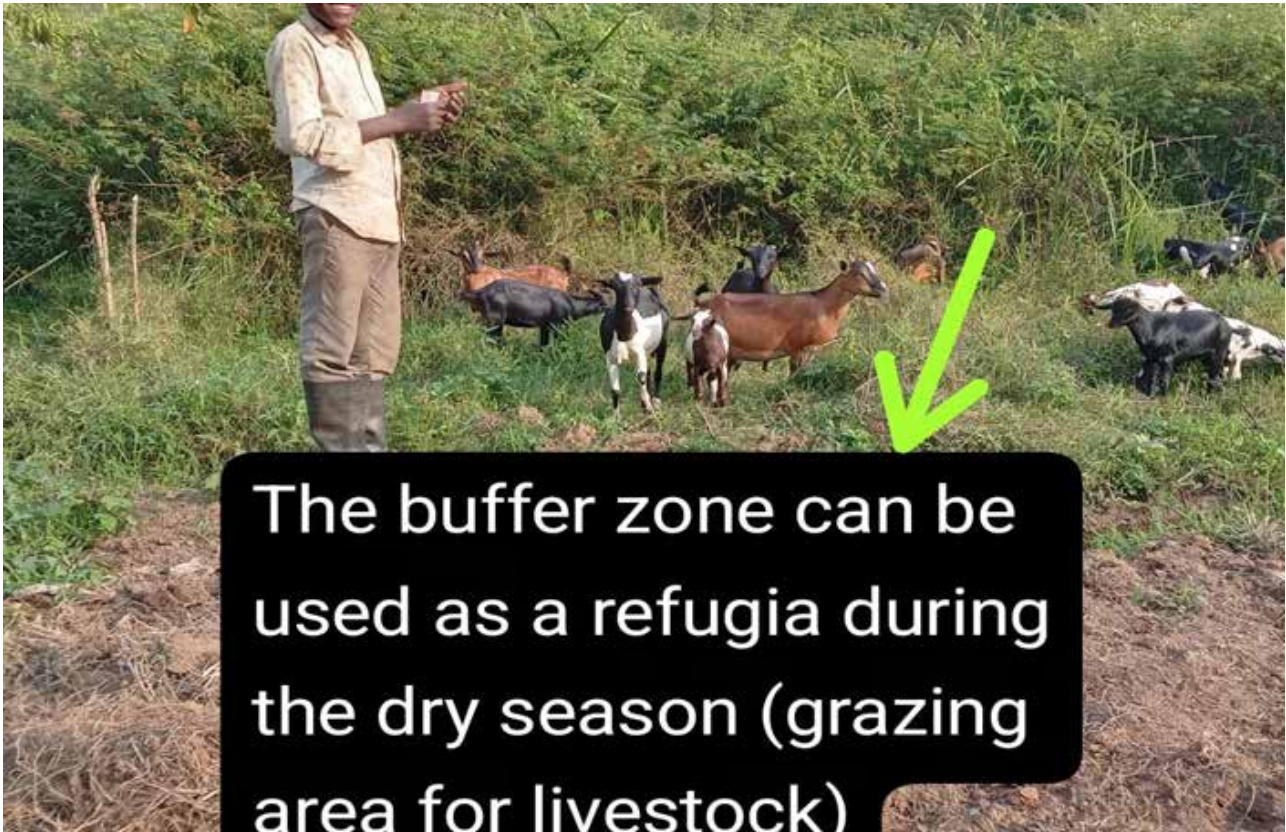
**PART FIVE: Non-extractive use**

**Annex 2. An introductory letter by Mubende district to the consulting team**



*Annex 3: Pictorial*

*Photo annexes showing some aspects degradation of R. Nabakazi Ecosystem*



*Showing irrigation water as a benefit from a well conserved wetland in Kyenyonza village, Kitenga Sub County*



*Annex 4: Different Fruit Trees to choose from To Plant in Buffer Area Sourced from Mubende District Forest Office*

- |  |                                 |
|--|---------------------------------|
| 1. Mangoes                                 | 31. Wetland yams                |
| 2. Avocado Hass                            | 32. Blue Berries                |
| 3. Avocado Fuerte                          | 33. Dragon fruit                |
| 4. Avocado Semil                           | 34. Egg fruit/canistel          |
| 5. Oranges                                 | 35. Peach seedlings             |
| 6. Tangerine (Mangada)                     | 36. Wine Berry seedlings        |
| 7. Lemon                                   | 36. Fig fruit seedlings         |
| 8. Cashew nuts                             | 37. Caracara oranges            |
| 9. Apple Guava                             | 38. Minneola oranges            |
| 10. Strawberry Guava                       | 39. Persimmon seedlings         |
| 11. Apples                                 | 40. Pepinno melon               |
| 12. Papaya                                 | 41. Brazillian cherry           |
| 13. Passion Fruits Grafted                 | 42. Nectarine seedlings         |
| 14. Soursop Kitaferi                       | 43. Peach seedlings             |
| 15. Pomegranate Enkoma Mawanga             | 45. Plums seedlings             |
| 16. Empafu                                 | 46. Cherry Guava                |
| 17. Jambula                                | 47. Jaboticaba                  |
| 18. Lime                                   | 48. Variegated Pink lemon       |
| 19. Pears                                  | 49. Hybrid meyer lemon          |
| 20. Citrus Paradis (Sekyunguwa) Sekyunguwa | 50. Blood oranges               |
| 21. Mulberry (Enkenene)                    | 51. Kiwi seedlings              |
| 22. Grapes                                 | 52. Ensali Loquat               |
| 23. Apple Banana (Ndizi)                   | 53. Kivuvu Banana (Java Banana) |
| 24. Cavendish Bananas (Bogoya)             | 54. Red Cavendish               |
| 25. Plantain Bananas (Gonja)               | 55. Oyster Nuts                 |
| 26. Hot meal Bananas (Matoke)              | 56. Tamarind (OMUKOGE)          |
| 27. Sugar Cane (Goa)                       | 57. JACKFRUITS                  |
| 28. Mangosteen                             | 58. Durian Fruit                |
| 29. Starfruit                              | 59. White Sapota                |
| 30. Pixie Oranges                          | 60. Pitango Cherry              |
|  | 61. Lychee                      |

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