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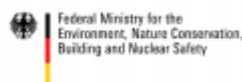
Rwanda The Biodiversity Finance Initiative (BIOFIN)

Economic Assessment of Akagera Wetland Complex: Identifying Finance Solutions for Improved Management

Policy Brief

Rwanda Environment Management Authority
(REMA)

January, 2019



There is a critical need to sustainably manage Rwanda's biological resources and ecosystem services upon which individuals, communities, and economies depend. Rwanda is particularly reliant on these natural resources, with over 65 percent of the population dependent on the country's agriculture, forestry, and tourism resources for income and food security. Protecting and investing in biodiversity conservation, which underpins these ecological goods and services, is an essential component of sustainably developing Rwanda's economy and achieving its green growth objectives. Under the UN Convention on Biological Diversity's 2011-2020 Aichi Biodiversity Targets, countries, including Rwanda, have committed to scale up resources for biodiversity conservation.

Developing a finance plan that mobilizes and scales resources for biodiversity requires an in depth understanding of the current expenditures on biodiversity, future needs to achieve biodiversity targets, and the economic value of Rwanda's biological diversity. The finance plan must include a suite of proposed solutions that redirect existing or generate new resources for use towards conservation. This study supports Rwanda's biodiversity finance plan by exploring possible finance solutions, based on the economic value of its goods and services, to preserve and protect the Akagera Wetland Complex (see Figure 1), a valuable inland wetland ecosystem in the Eastern Province that contributes to Rwanda's economy and social welfare.

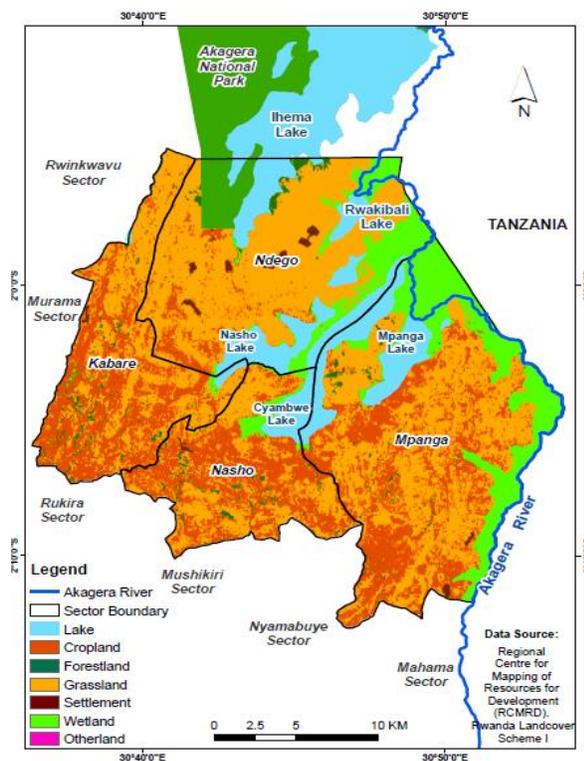


Figure 1 Map of Akagera Wetland Complex

The objective of the Akagera Wetland Complex study is to understand the current drivers of ecological degradation, estimate the economic value of the stocks and flows of ecological services provided by the wetland, and, based on these findings, propose a suite of possible finance solutions to improve the ecological status and management of this valuable ecosystem.

Results from the economic valuation revealed that the Akagera Wetland Complex provides a number of provisioning, supporting, and regulating services to the local, regional, and global community. The wetland contributes to climate change mitigation by sequestering and storing carbon, retains sediment and nutrients from upstream erosion, and moderates extreme events downstream such as flooding and droughts. Both domestic households and commercial agricultural entities depend on the fertile soils surrounding the wetland and water from the lakes for irrigation, drinking water, and other materials. The total annual flow of benefits from the Akagera Wetland Complex is estimated to be 12 million USD, with a total stock value of 1.1 billion USD in carbon storage. (see Table 1)

Table 1 Summary of Akagera Wetland Complex - Annual Economic Values

	USD	Rwf (1 USD = 885 Rwf)
<u>STOCKS</u>		
Carbon Storage	1,091,852,288	966,289,274,612
TOTAL STOCKS	1,091,852,288	966,289,274,612
<u>FLOWS</u>		
Provisioning Services		
Commercial - Direct Use		
Commercial dairy production - fodder/water	142,599	126,200,000
Commercial agriculture - irrigation	5,371,536	4,753,809,360
Commercial fisheries	133,966	118,560,000
Domestic Household Use		
Agriculture (soil fertility and irrigation)	541,506	479,232,810
Water for drinking, cooking, bathing	375,392	332,221,992
Other (bricks, papyrus)	6,637	5,873,745
Regulating/Supporting Services		
Carbon Sequestration	3,227,930	2,856,718,050
Sediment Retention	748,580	662,493,696
Moderation of Extreme Events (flood attenuation)	1,400,000	1,239,000,000
TOTAL FLOWS	11,948,147	10,574,109,653

As can be seen, the Akagera Wetland Complex provides valuable services to local and global communities, and justifies the investment in ensuring these benefits are secured into the future. A majority of the annual benefits are gained through the provisioning of water for irrigation, which increases crop yields two to threefold, and the sequestration of carbon. In addition, wetlands have some of the highest sequestration rates of any ecosystem type, and are thus critical to mitigating against further climate changes.

Based on the results of the valuation and stakeholder engagement, a suite of finance solutions was considered to improve management and mobilize additional financial resources to secure the Akagera Wetland Complex's ecological integrity. These finance solutions are intended to either lead to a financial impact along one of four results pathways:

1. **Generate** revenue for biodiversity (e.g. fees and taxes)
2. **Realign** current expenditures to reduce negative impacts and improve biodiversity outcomes (e.g. subsidy reform)
3. **Avoid** future biodiversity expenditures through strategic biodiversity investments and policy changes
4. **Deliver** improved effectiveness and efficiency of financial resources (e.g. merge funds and streamline procurement)

Restore ecological integrity through enhanced land stewardship

It has become clear that the entire landscape surrounding the Akagera Wetland Complex depends upon the resources provided by the wetland, including its fertile soils for agriculture, water for irrigation and domestic household use, and fodder for cattle feed. Therefore, a holistic approach to landscape management must be taken that accounts for all users of the wetland. The purpose of enhanced land stewardship is to support conservation and restoration actions on private lands that decrease the costs of land management for private land owners, thus creating an incentive for land owners to pursue conservation actions.

The area surrounding the wetland complex is important for dairy production, as the lakes provide access to water for cattle, and the surrounding fertile landscape is well-suited for the fodder species farmers depend upon to feed their cattle. Livestock production is better-suited than agricultural crops in the immediate vicinity of the wetlands, as the impacts on the wetlands are reduced. It is therefore suggested to promote the dairy farming sector through the introduction of intensive silvo-pastoral systems in the surrounding grasslands. Silvo-pastoralism is a form of agroforestry that integrates trees and shrubs on livestock pasture. Silvo-pastoralism is well suited for areas that tend to suffer from droughts, thereby affecting forage quality, as the integrated system aims to efficiently use environmental inputs to produce higher quality and quantity outputs.

The World Agroforestry Center (ICRAF) is currently implementing a multi-country program, *Trees on Farms for Biodiversity (TonF)* that aims to address farmer preferences for agroforestry and index biodiversity in these farming systems. The aim of both the UNDP BIOFIN initiative and ICRAF's TonF program are well-aligned to increase biodiversity outcomes through resource mobilization, and are well-matched to support this study objective. Their unique scientific and political focus on agroforestry can provide the needed expertise to conduct a broader feasibility study in the landscape to investigate the potential for increased tree cover in the grasslands surrounding the wetland complex. This 'win-win' solution will not only promote the economic potential of dairy farming, but also restore the landscape surrounding the wetlands, thereby reducing the harmful effects of both dairy production and the upslope crop production.

This finance solution could result in the avoidance of future biodiversity expenditures, deliver cost-effective resources towards biodiversity, and realign existing extension services to promote biodiversity on farm land. There will likely be a delay in the benefits realized by planting trees on grasslands and will require upfront investments. Access to finance will be needed to encourage farmers to adopt silvopastoral systems. Therefore, a low-interest line of credit will need to be capitalized and made available to farmers interested in planting trees. A fund could be capitalized through water user fees, fishing cooperative fees, and other environmental fees imposed within the administrative region. The fund could perhaps be managed by the local SACCO or bank branch in the area.

Invest in Organic Fertilizer Production and Use

According to the 2017 Seasonal Agricultural Survey – Season B, 17.7% and 15.6% of plots within Kayonza and Kirehe, respectively, use organic fertilizers. These districts are far lower than the

national average of 39.2%. By promoting the use of organic fertilizer, or semi-organic fertilizer schemes, the current chemical fertilizer application rates can be reduced.

Based on the results from this study, huge amount of sediment, enriched with chemical fertilizers are exported daily from wetlands of Rwanda, Tanzania and Burundi with Nile basin water flow. They also contain significant amounts of organic matter. Initially, a feasibility study should be conducted to inform the decision makers, private sector and interested stakeholders of the opportunity provided by the existence of huge amounts of those sediments in the wetlands. Investments in sediment collection, organic fertilizer, and other biodiversity-friendly enterprises, could be incentivized through government subsidies (e.g. price support, tax relief), grants (enterprise challenge through FONERWA or other green funds), and bonds (see green bonds below).

Improved Buffer Zone Management

The Rwandan Government has initiated a number of activities aiming at restoring and protecting the buffer zone around the Akagera Wetland Complex. Delineation of the protected area zone (50m) has been drawn and some trees planted. Species that have been planted to protect the buffer zone include *Grevillea robusta* and *Bambusa vulgaris*. The two species are both exotic, despite the complex being endowed with a number of local tree species adapted to the local conditions. These local tree species can also contribute to biodiversity conservation.

Field observations revealed that lakes surrounded by cattle farms are more productive compared to those surrounded by intensive agricultural lands like Cyambwe lake. It is emphatically clear that livestock farming can prosper in symbiosis with wetlands biodiversity conservation if properly managed. Based on field discussions with cattle farmers, it was revealed that the buffer zones are very important for their cattle productivity, providing access to food and water throughout the year. Therefore, it is strongly recommended to plant palatable species preferred by cows in the buffer zones to make them both useful to local communities and wetlands protection. The species that are recommended are local species such as *Panicum maximum* or *Panicum coloratum*, both already widely cultivated in the region to feed livestock. *P. coloratum* provides an excellent forage for both cattle and wildlife such as hippos that inhabit the lakes of AWC. Reference made to the preferences of farmers and to the biodiversity conservation requirements, *Bachiaria* (ivubwe), *Chloris gayana* and *Mucunapruriens* should also be added on the list of species that should be planted as forage. These are all tropical plant species adapted to local conditions and useful for local biodiversity conservation. In addition, special management protocol of the buffer zone should thereafter be developed and implemented in partnership with local wetlands users.

Through enhanced budget execution and reform, current expenditures could be realigned to improve biodiversity outcomes, and improve the resource base depended upon by dairy farmers in the vicinity.

Improved Fisheries Management

The fishing cooperatives surveyed within the Akagera Wetland Complex all reported declining yields. Rwanda lacks a centralized fisheries management agency (MINAGRI's Directorate of Animal Resources is mandated with implementing the fish master plan) with limited private sector investment, with management falling primarily to the local fishing cooperatives. In addition, in the absence of stock assessment data, it is difficult to ascertain maximum sustainable yield levels to ensure that fish stocks do not continue to decline. To optimize fish production from the AWC, improved management of fisheries resources needs to be secured to remove invasive plant species (e.g. water hyacinth), mitigate the negative effects of invasive predators (e.g. Imamba), and conduct a stock assessment to determine maximum allowable catch, which can in turn be allocated and managed through fishing quotas allocated through the permit system.

Financing for the improved management of fisheries could come from fishing permit fees. The revenue generated from the sale of permits (which includes the quota) can be earmarked to cover the cost of conducting a stock assessment, setting fishing quota limits, and regulating the industry.

Wetland and Water Abstraction Fees

Irrigation water for the three major irrigation operations in the Akagera Wetland Complex provides over 5.3 million USD in benefits every year in the form of improved yields, amounting to approximately 2,500 USD per hectare per year. Based on the proposed water use fees, these enterprises will be required to pay fees in the amount of 3,000 Rwf (approx. 3.40 USD) for each hectare irrigated¹. Based on the total hectares under irrigation in these three commercial operations (2,110 hectares), the revenue generated by the water user fees is anticipated to be 7,153 USD annually. Therefore, these fees could be revised, or wetland fees could be proposed, to increase the revenue generated by these commercial activities, which can in turn cover the costs of proper water monitoring (e.g. installing gauging stations). Commercial entities dependent upon the wetland's water resources should cover the costs to monitor water quality, and the revenue can be generated either through revising the existing fee structure, or adding a wetland user fee to the existing water permit fees to account for the cost of establishing a gauging station. It is clear from the benefits derived from the wetland's water resources (5.3 million USD annually) are far greater than the water user fee costs (7,153 USD annually) and is therefore justified to make this investment.

Green Bonds

Green bonds can also be applied as a financing instrument in Rwanda to finance projects such as organic fertilizer development artificial fish farming, renewable energy, and other projects that could support the AWC. The channel of green bonds assurance should pass through BRD, a bank already involved in financing environment conservation and development projects in Rwanda, and FONERWA, Rwanda's environment and climate change investment fund. BRD is a renowned and

¹Annex 1 to the draft Ministerial Order Establishing the List of Activities and Installations Subject to a Water Use Permit and Determining Conditions, Procedures of Acquiring the Water Use Permit.

reliable institution that could be leveraged to mobilize and attract investors to green enterprises in Rwanda. FONERWA and BRD already have a low-interest line of credit established to incentivize private sector investments in green enterprises.

Establish a Biodiversity Information System

Like many other ecosystems in Rwanda, overcoming data limitations is critical to sustainably manage the AWC. The absence of up-to-date information impairs decision-makers and local authorities to solve environmental conservation issues in a timely manner. For instance, little is known about habitat loss, species populations dynamics, water quality, endemic or threatened species, fish production, etc. in the study area. In brief, there is a lack of an early warning system that must be established to support biodiversity solutions in the landscape.

A Biodiversity Information System, with government input, could be a valuable tool to monitor ecosystem health and biodiversity, and could benefit from a ‘Citizen Science Community’ approach, where participants are trained in data collection through mobile devices and transferred to a central hub (e.g. Rwanda’s Center of Excellence in Biodiversity and Natural Resource Management). Although establishing a biodiversity information system is not a financial instrument, through improved knowledge of biodiversity status and trends, current expenditures for biodiversity can deliver better results and future expenditures can be avoided.

Conclusion

The Akagera Wetland Complex plays a crucial role in maintaining local livelihoods, and significantly contributes to the regional, national, and global economy. This study has estimated that the total economic value of the Akagera Wetland Complex is USD 1.1 billion in stocks (i.e. carbon storage), and USD 12 million in annual flows (i.e. carbon sequestration, provisioning services, etc.), contributing to the well-being of domestic households, commercial enterprises, and the global community through the provisioning of goods as well as supporting and regulating services. It is recognized that the costs of restoring wetlands and their ecosystem services are often far higher than the costs of maintaining the ecological character of intact wetlands, and this study justifies investments in protecting and conserving these resources so that they can continue to support sustainable economic development into the future.

Based on the findings from the economic valuation and assessment of the domestic and commercial uses of the wetland, a suite of finance solutions has been proposed that will secure the benefits communities depend upon. Promoting improved land management through silvopastoralism, establishing biodiversity information systems, improving buffer zone management, improving fisheries management, reforming wetland and water user fees, and establishing a green bond to incentivize investments in green enterprises such as organic fertilizer could all lead to improved biodiversity and ecosystem outcomes.

By considering the economic value of the Akagera Wetland Complex, and implementing the proposed finance solutions set forth in this study, Rwanda will be contributing to its Vision 2020 agenda as well as the global commitments made under the UN Convention on Biological Diversity’s Aichi Targets and Sustainable Development Goals.