

WITHERING BOUNDARIES:

Nile Basin Wetlands
Shrink As Communities
Quest For Life



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Acknowledgment

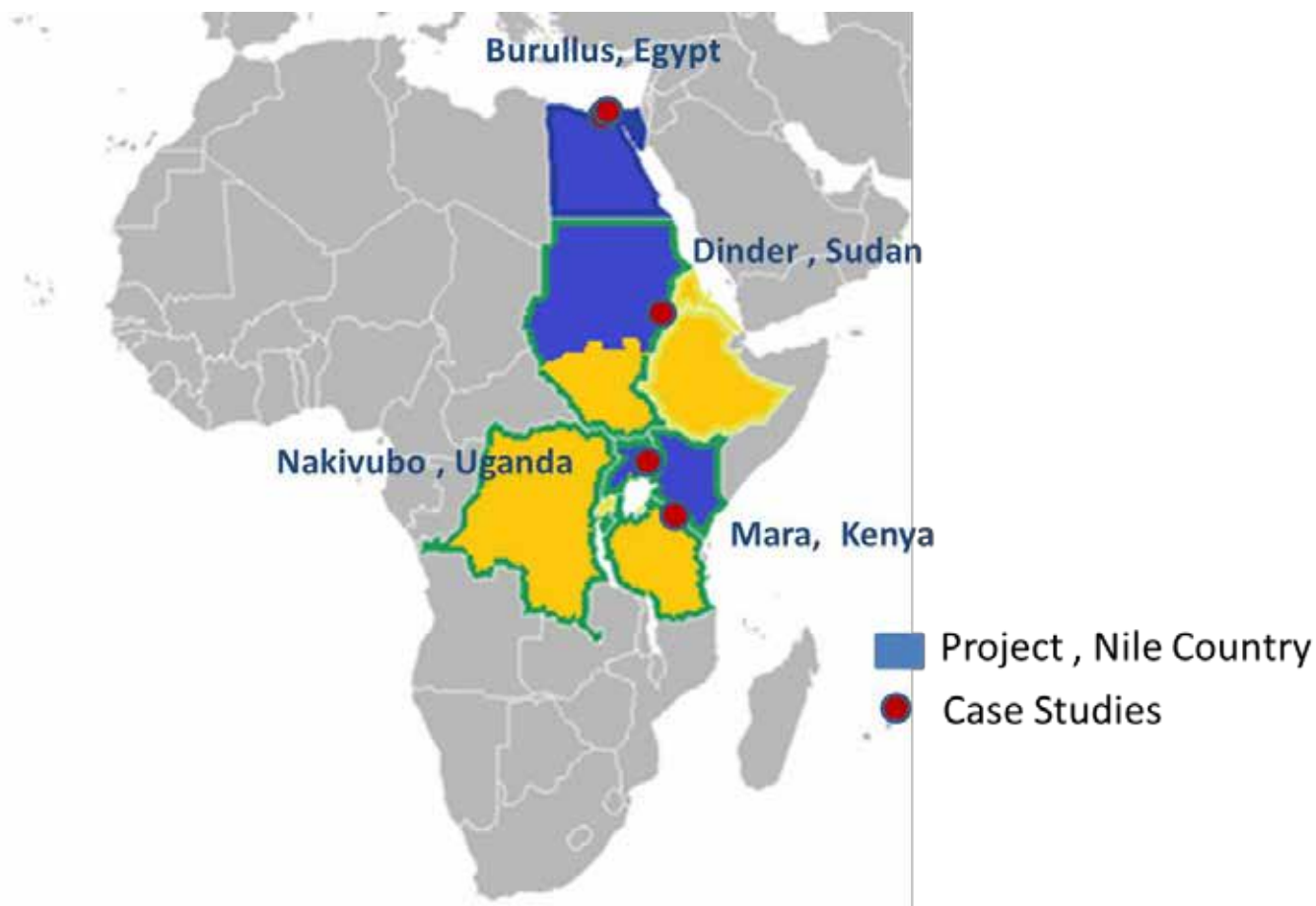
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The project partners also would like to express their sincere thanks towards Mr. Fredrick Mugira, a multiple award-winning water journalist and development communication specialist, who supported us in writing these articles.



Forward

THE ARTICLES and pictures in this magazine came from the Nile Eco-VWU Project which focused on developing and testing integrated tools for wetland ecosystem services, valuation, and assessment that can be applied at local and regional scales within the Nile Basin.

It was guided by the methodology of the Economics of Ecosystems and Biodiversity Reports (<http://www.teebweb.org/areas-of-work/biome-studies/teeb-for-water-and-wetlands>), and those of the Wet-Health (www.wrc.org.za) and TESSA toolkit for rapid assessment of wetlands of biodiversity conservation importance.

The project reviewed and applied appropriate ecosystem assessment and economic methods to support local and regional understanding and decision making for wetland management. This provided a more evidence-based policy and management method to evaluate tradeoffs of different ecosystems services in relation to agricultural, urban and infrastruc-

al development.

Better understanding of the consequences of decisions related to ecosystem services will help optimize wetland use for Total Economic Value (TEV), to ultimately contribute to better livelihoods of local communities dependent on wetlands, as well as local and regional policy making and implementation.

Case studies will play a major role in the project implementation by providing direct interaction with stakeholders and next users, highlighting the needs for improvement of the existing management tools, and challenging the application of the economic valuation of wetland services for better livelihoods.

Each of the selected case studies represented a specific type of wetland and specific climatic, hydrological and environmental characteristics, and has a specific contribution to the project based on the different existing ecosystem services, but all the pilot areas shared

common objectives to allow comparison across current existing services, challenges and applied economic tools for better decision making.

Four case studies were considered in this project:

- i. Burullus Lake, Egypt ;
- ii. Dinder Wetland, Sudan
- iii. Mara Wetland, Kenya-Tanzania;
- iv. Nakivubo Wetland, Uganda.

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Biting the Hand That Feeds You:

Lives Thrive as Uganda's Nakivubo Wetland Vanishes

JASENTA KYAMPAIRE (45) began growing sugarcanes 30 years ago on a small piece of land in Nakivubo wetland. Today, that piece of land is no longer part of the wetland.

It is part of the land where hundreds of new walls, barriers and fences have been built. And there are many types: barricades between plots of land, walls around houses and fences that zigzag through the land that was formerly a wetland.

But this has not stopped Jasenta from growing sugarcanes. She keeps shifting her garden into the remaining part of this wetland, which connects the city of Kampala to Lake Victoria at the Inner Murchison Bay.





Jasenta is one of the people that benefit from Nakivubo wetland by growing coco yams, vegetables, sugarcane, mining sand, collecting water for domestic purposes and harvesting fodder for feeding livestock

But as these farmers continue earning livelihood from the wetland, a new study by researchers at Makerere University has found that, this is occurring at the expense of the main ecosystem service that this wetland used to provide — wastewater treatment.

The researchers led by Prof. Dr. Frank Kansime, of Makerere University, Department of Environmental Management note that 56 percent of this wetland has been modified majorly due to industrial development and cultivation of crops.

They assessed the economic value of the ecosystem services provided by Nakivubo wetland, a tropical and perennial wetland.

The researchers observed and interviewed people who use and live around the wetland during the May-July 2015 study. Up to 103 respondents were randomly selected

from 15 villages of Nakawa and Makindye Divisions to take part in this assessment study.

On average, the study concludes, there are 206 farmers engaged in sugarcane growing in the three parishes around Nakivubo wetland and each farmer gets, “ a net income of about 27.1 million UG Shs (7900 USD) per year after excluding the amount of sugarcanes that a farmer consumes along with people in his/her household.”

Yams are the most common grown food crops within this wetland. There are, “67 yam growers around Nakivubo wetland,” and per hectare, in a single harvest, “4000 kgs of yams are harvested,” the study notes.

Each farmer, the study continues, earns, “1, 776,121.61 UG Shs (about 500USD) per year from the growth of yams per hectare.”

Evidently, this makes the growing of the two crops a lucrative business in a country where unemployment remains a serious challenge.

Nakivubo wetland

Nakivubo wetland, located both in Nakawa and Makindye divisions in Kampala city, connects Kampala city to Lake Victoria at the Inner Murchison Bay. It is approximately 2.5 square kilometers of which 56 percent is modified by agriculture and industrial activities.

Bordered by residential areas both in the west and the east, an industrial area in the north and Lake Victoria in the south, Nakivubo wetland covers Kisugu and Bukasa wards in Makindye division and Bugolobi, Luzira Prisons and Luzira wards in Nakawa division.

Nakivubo wetland plays a major role in wastewater treatment, with most of the wastewater from Kampala City passing through the wetland before it discharges into Lake Victoria at the Inner Murchison Bay. For more than 40 years now, Nakivubo channel has been discharging treated and partially treated wastewater from Kampala city into the Nakivubo wetland.

With the surrounding areas under Lease-hold, Free-hold and Mailo land tenure systems, Nakivubo wetland is on public Land.



Wetland Alteration and Impact

Writing in the final report, the researchers concluded: “Nearly all men (96.7 percent of the respondents) noted that Nakivubo wetland has changed from the way it was 10 years ago. Likewise, majority of female respondents (82.9 percent) noted that the wetland has changed over the same period.”

Bugolobi and Luzira are the most parts of the wetland utilized by respondents for crop growing or exploitation of other wetland resources.

The assessment study attributes changes in Nakivubo wetland to settlement in the wetland, increased amount of water and chemical pollutants.

The main changes pointed out were:
 Building in the wetland;
 Increased water in the wetland;
 Declining products and species from the wetland;
 A decline in growing of yams;
 A decline in the ability of the wetland to retain water and control floods.

As a result of these changes, the

wetland dwellers are now turning to other activities as an adjustment to the declining ecosystem services.

Nakivubo wetland is not the only wetland in Uganda facing pressure from neighbouring communities that may result in extinction if not controlled.

Data from Uganda’s Ministry of Water and Environment indicates that up to 30 percent of Uganda’s wetlands were lost between 1994 to 2008. In this period, Uganda’s wetlands reduced from 37,575.4 sq. km in 1996 to 26,307.7sq km in 2008.

And the encroachers of these wetlands are not doing so out of ignorance! Because according to this study, “majority of the male respondents (75.4 percent) reported having knowledge of institutions and policies that govern the use of wetlands and 50 percent of the female respondents reported knowledge of institutions and policies that govern wetland use.”

Economic Values and Rewards

The study documented agriculture as the main activity in the wetland.



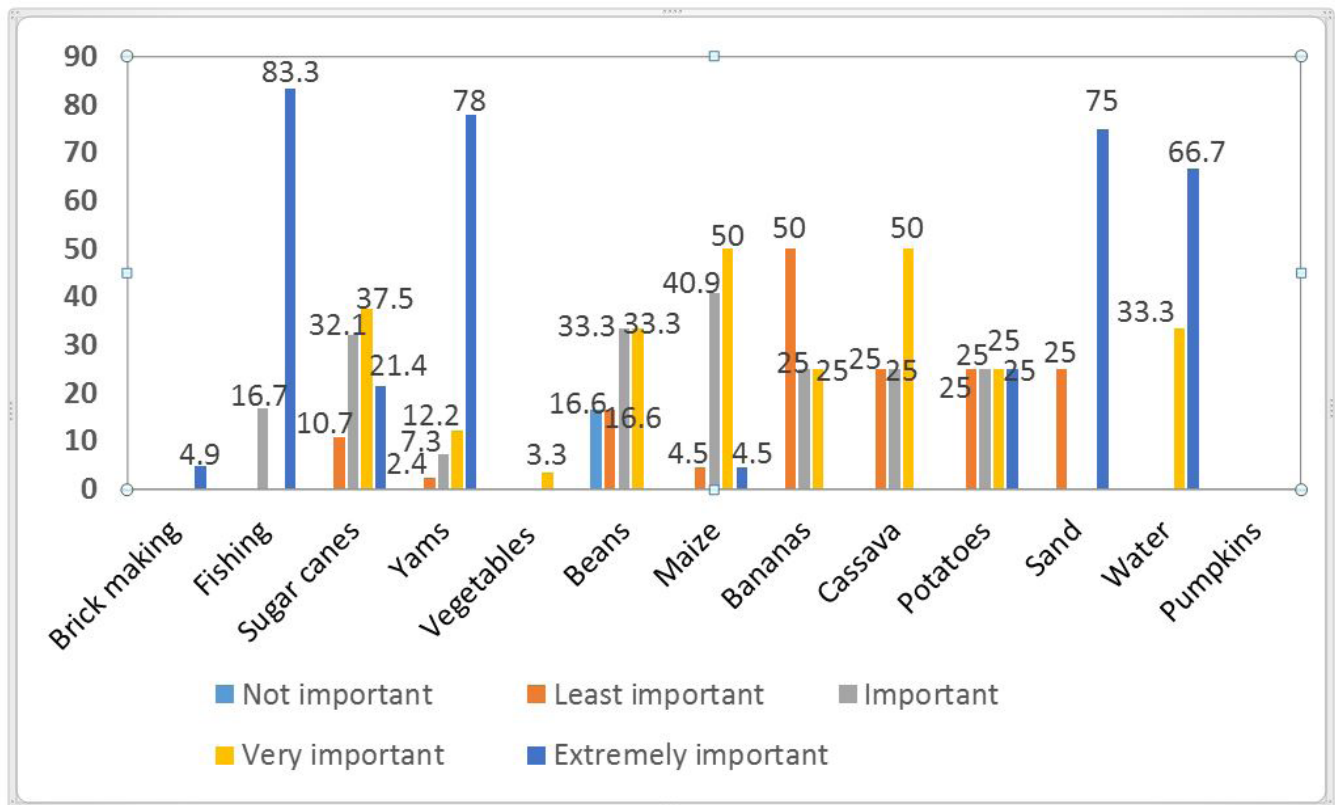


Around Nakivubo Wetland in Photos

Nakivubo wetland provides livelihoods to the surrounding communities although this in the long run will compromise the water quality in the Murchison Bay







Importance of benefits obtained from Nakivubo wetland to male wetland users

Apart from sugarcanes and yams, other crops grown in the wetland include vegetables. Each household engaged in vegetable growing earns about 507,988.8 UG Shs (150 USD) per year according to the study.

And also each household harvesting fodder in this wetland for feeding livestock gets 15.9 million UG Shs (4700 USD) per year.

Other products harvested from this wetland include, “sand, clay, papyrus, fish and water,” according to the assessment study.

The products from the wetland are not only consumed at home but also sold within and outside the community, including Kampala city.

The direct use value of the main provisioning services of Nakivubo wetland Local communities (one household per hectare per year) is worth over 14,800 USD, the study found out.

Besides economic value, the vegetation in Nakivubo wetland slows down the speed of water flowing into the wetland; treats waste water, provides fuel wood, craft material and medicinal plants.

The wetland also provides a habitat for different flora and fauna, attracts tourists and provides a research and educational environment. This is according to the study.

Some Gender considerations

Just like other male-dominated businesses worldwide, the study discovered that, local communities carrying out activities in Nakivubo wetland are dominated by males at 59.2 percent. But what is interesting is that, “the female population is more likely than their male counterparts to be affected in case of any evictions from exploitation of wetland resources.”

Producing of the most common grown food crops in this swamp – yams – is

considered, “extremely important by both males and females,” compared with growing pumpkins, mining sand and collecting water for sale.

Other economic activities in this wetland include fishing which is dominated by males while sugarcane and vegetable growing is dominated by females.

Recommendations

The study concludes that although this wetland is providing livelihoods to the surrounding communities, this will in the long run compromise water quality in the Murchison Bay — the place where the water supply for Kampala is abstracted.

It subsequently, recommends restoration of the wetland with natural vegetation; limiting of agricultural activities to the wetland edge and holding of consultations to formulate a comprehensive wetland management plan.



Exterminating the Green:

Sudan's Dinder Wetland Struggles to Survive Amidst Encroachment

THERE ARE a lot of things that make a tour to a national park memorable: game ride, artifacts, traditional food and bird watching among others. That's typically what comes with a visit to Dinder National Park – some 500 Km South of Khartoum, in

Sudan.

So, when planning a visit to Dinder National Park, don't forget your binoculars for bird watching.

A host of birds cross Sudan while on their way from Europe and Asia during winter. Some of them make

a stopover in Dinder National Park's wetland, which lies on the migration route of African wintering birds during their pass to the eastern African Rift valley lakes or southward.

Dinder wetland is a home to a large population of animals, insects, fish and provides a refuge for about 250 species of migratory birds.

Sadly, in future, these birds could be forced to take refuge in another place due to several threats faced by Dinder wetland's ecosystems and biodiversity as documented in a new study.

The study led by Prof. Dr. Abdalla Abdalslam Ahmed, UNESCO Chair in Water Resources, Sudan assessed the economic value of the ecosystem services provided by Dinder wetland. It highlights activities, especially

grazing, cultivation, tree felling, poaching, and bush burning as some of the threats that tend to reduce the nutritional quality of wildlife forage, and affect the biodiversity, putting in jeopardy the very function of the wetland ecosystem in the park.

“These problems and threats are all related to various human activities by the communities living around and within the wetland and also by those who are living in large towns,” the research continues.

Other threats to this valuable wetland, as documented by the study include:

- Soil erosion;
- The impact of Grand Ethiopian Renaissance Dam (GERD) on the whole river Nile system;
- Horizontal expansion of agriculture;
- Urban development in wetland areas;
- Poaching;
- Limited funding sources ;
- Shortage of essential skilled staff ;
- Lack of communication facilities;
- Climate change impact;
- Illegal harvest of some of the natural resources in the park;
- And difficulties in implementing common conservation activities, communication and support of sustainable development due to the fact that Dinder wetland is bordered by 3 states.

Dinder Wetland

Dinder wetland covers an area of 10.291 km². It lies along the transition ecotone zone between two floristic regions; the Ethiopian highland plateau and the arid Saharan — Sudanian biomes.

Situated along the boundary of two major faunal realms of the world — paleoartic and Ethiopian region, Dinder has high diversity of the flora and fauna communities and was designated as Ramsar site in 2005.

The Dinder wetland is administrative-



ly managed by the Wildlife Conservation General Administration (WCGA) which falls technically under the Ministry of Tourism, Antiquities and Wildlife and administratively under the Ministry of Interior Affairs. Dinder was declared as a National Park (DNP) in 1935.

Ecological Status

Despite the threats, the wetland's ecosystems and their adjacent riparian, habitats continue to perform important ecological functions such as source for water resources, flood storage, erosion control, sediment trapping and wildlife protection, according to the study.

Undisputedly, Dinder wetland holds a variety of wildlife species— herbivores, carnivores, reptiles, amphibians, insects and bird species — distributed in the three major wetland ecosystems of A.seyal-Balanites woodlands; Riverine and the Mayas ecosystems.

Each ecosystem has its own plant and animal communities and each contributing to the overall diversity of the area. The study documented a serious decrease in the number of some species such as Tiang (*Damaliscus lunatus tiang*), and Roan Antelopes (*Hippotragus equines*) in the last two decades.

During this study, several species such as reedbuck (*Redunca redunca*), waterbuck (*Kobus ellipsipry mnsud-fasa*), oribi (*Ourebi aurebia*), warthog (*Phacochoerus aethiopicu*) Cape buffalo (*Syncerus caffer caffer*), baboon (*Papio anubis*) and many birds and water fowls were seen, especially in Abdel Gani maya, which is the closest one to the Dinder Camp.

Economic Values and Rewards

A part from the pronounced tourism, the study documented the harvest of Saaf — the young leaves of the dome



palm (*Hyphene thebica*) for making mats, baskets, honey pots and handicrafts as one of the main economic activities in Dinder wetland.

Saaf is harvested by women and sometimes by the men who sell it to women. An average woman collects three bundles of Saaf per day, according to the study. The Saaf can be collected throughout the whole year. Products made out of Saaf — Mat-Bresh, Brooms and Baskets — are used at home while others are sold for income generation. A bundle of Saaf costs 4 SDG (0.67 USD), the study reveals.

Saaf has also social functions and is of symbolic significance being weaved and tied around the hand and leg. The study found that Saaf is perceived as a protection for spouses and circumcised girls against evil eyes. It is also used to protect a corpse from decaying until it is buried.

Other economic values of this wetland as documented by the study include: grasses used for building huts; trees used as poles for building huts; branches of *Balanites egyptiaca* (*Entada Africana*) used for production of wood-blender locally known as Mfareek.

Just like in most wetlands across Africa, charcoal burning; fishing; honey collection; manufacturing of traditional medicine from herbs reaped from plants and wild animals in the wetland were also documented as flourishing businesses. Some local communities hunt wild animals and birds for food and sell the game meat to workers at agriculture farms. A kilogram of antelope meat cost 100 SDG (60 USD)

Several communities around the wetland are also engaged in agriculture. They grow sorghum and millet on small plots by traditional rain-fed cultivation, within five kilometers of their villages. And ecologically,

the study notes that Dinder wetland prefixes water, traps sediments and attenuates floods.

Gender and Equity Status

“There are no equal opportunities for women and men for productivity and income, and only few have equal right to wetland products,” the study concludes further indicating that men duties are Gerf cultivation and mechanized farming while women and girls practice rain-fed cultivation in the home garden (Jobraka) close to their homes.

In communities close to Dinder wetland, men are the family heads. However, some families are headed by women. The latter is attributed to husbands’ migration to other towns searching for new jobs or they are widows.

The sharing of benefits for both women and men from wetland ecosystems differs because the levels of income from the different jobs and activities are not equal. Boys assist their families in agriculture and grazing. The main reason is to improve the income. Women and girls participate in grazing and water collection.

Conclusion

The researchers conclude that, Dinder Wetland has direct impact on the production and consumption of goods and services — fish, water, medicinal, raw materials — and indirect values such as ecosystems functions and services — water quality, flood control, and nutrient retention among others. It also provides a wealth of non-consumptive values such as cultural, aesthetic and heritage values.

Social and cultural structures impact the access to the Dinder wetland resources, services and further affect the decision-making process in communities close to the wetland, the study concludes.

HUMAN ACTIVITIES:

Deforestation and Croplands
Expansion Threaten Mara Wetland



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tos



For hundreds of years, it has been a home to several reptiles, plants, animals, birds and insects — becoming synonymous with hospitality in the wildlife world. In fact, many of Mara River Basin wetland's plants, animals and insects cannot be found anywhere else in Kenya and Tanzania.

But nowadays that synonymous does not seem so apt. The wetland is highly affected by human activities — mainly deforestation and crop farming.

This is according to a new study by researchers at Egerton University and Tanzania's Ministry of Natural Resources and Tourism, led by Prof. Nzula Kitaka.

The May-July 2015 study which assessed the economic value of the wetland's ecosystem services was conducted in 180 households from the six villages of Kwibuse, Kembwi, Bisarwi, Ryamisanga, Kirumi and Kongoto, neighbouring the wetland.

“The clearing of forests in the Mara River Basin has resulted into increase in open canopy forests and tea plantations by +214 percent. Savannah grasslands and shrub land (rangelands) on the other hand have decreased by 35 percent due to expansion of agricultural land by 203 percent,” the study documents.

One of the reasons why trees in Mara wetland floodplain are cut is to produce charcoal.

In fact, the study indicates that charcoal production from the trees growing in the wetland's floodplain —practiced by 17.6 percent of the people there — is one of the most lucrative businesses in the communities living close to the wetland.

In these communities, charcoal production generates a relatively high annual net income of TZS 1,032,797.19 (USD 473.83) probably due to the fact that the trees used for the activity are obtained for free, the study concludes. And on average, according to the study: “91 bags of charcoal are produced per year of which seven are used for home consumption and 84bags for sale.”

The figures seem impressive as far as poverty eradication is concerned. However, when it comes to conservation of the wetlands, they are disheartening.

This is more so because, researchers noted an increase in soil erosion in the Mara wetland basin due to the reduction in sub natural vegetation cover caused by deforestation and increase in agriculture. Soil erosion, coupled with poor management of cultivated land and over grazing leaves communities staying around this wetland at a great environmental risk.

Mara wetland

Mara wetland is a riparian papyrus wetland situated in the Mara River Basin which is a transboundary basin shared between Kenya and Tanzania.

The basin covers an area of approximately 13,750 km² of which 65 percent is located in Kenya and 35 percent in Tanzania.

The wetlands' source of water is mainly the Mara River which originates from Enapuiyapui swamp in the Kenyan Mau Escarpment.

The Mara River meanders through large and small scale agricultural farms before entering the Masai Mara Game Reserve and the Serengeti National Park in Kenya



and Tanzania respectively, and finally ending its-395 km journey by discharging into Lake Victoria through the Mara wetland near Musoma town, Tanzania

The wetland covers an area of approximately 164km² with seasonal variations from 135 km² in dry season to 186km² in rainy season.

Existing Ecosystem Services

Besides charcoal production, researchers documented papyrus mat making— practiced by minority 29.5 percent of the community members living near Mara wetland, as another activity in the basin. On average, 168 bundles of dry papyrus are harvested annually which generates approximately 432 mats per house hold. The annual net value of mats is TZS 360,260.10 (USD166.71).

Among all the provisioning ecosystem services derived from the Mara wetland, brickmaking is the least practiced activity by the local communities — just only 2.8 percent.

This may also explain the relatively low annual net value of 172,827 (USD79.98) generated from brick making.

The study found out that water abstracted from the wetland is used mainly for domestic purposes. The dependence on this water however varies with season — low during rainy season and high during dry season. On average the daily amount of water used by each house hold for domestic purposes is 100 litres.

Water abstraction from the wetland, though for free, has a monetary value of TZS 280,000 (USD128.17) per year. This implies that the water from the wetland should be used sustainably since the community may have to spend the same amount of money in case the service of water provision is no longer provided by the wetland.

Fish production was also observed among the activities happening in Mara wetland. Fish commonly harvested from the Mara wetland include: lung fish, cat fish and Nile ti-

lapia. The local communities practice both commercial and subsistence fishing with minority of them being engaged only on fishing for home consumption especially during the rainy seasons when fish is abundant.

Annually, the study continues, cat fish and lung fish generate a gross income of TZS 2,677,714.20 (1226.98 USD) and TZS 9,046,128 (4145.12 USD) respectively. The net value of fish harvested from the wetland is TZS 14,825,782 (USD 6,860.61) per year.

Other benefits of the swamp included the use of swamp materials for house roof thatching, livestock grazing, firewood fetching among other activities.

Gender and Equity Status

In the Mara wetland, the researchers conclude, “gender based labour division defines which gender group has more or less access to Ecosystem Services. For instance, fish is more accessible to men (60.2 percent) than women (5.8 percent)



while women have more access to firewood (73 percent), water (52.8 percent) and papyrus for mat making (60.0 percent).”

Thatching grass is also more accessible to men (48.4 percent) than women (11.2 percent). Both men and women have more access to clay soil for brick making (58.3 percent) and trees for charcoal production (72.6 percent). This implies that women are more dependent on the wetland Ecosystem Services than men based on their daily activities, such as water abstraction for domestic use, firewood collection and papyrus mat making for both domestic and commercial purposes.

Meanwhile, men are only involved in fishing and house roof thatching. Roofing of the houses is, however, an occasional activity; only taking place when need arises, for instance, when a new house is built or re-thatched. According the study, this suggests that, “traditional division of labour limits men access to wetland Ecosystem Services while at the same time

overburdens women in supporting household’s livelihoods.”

With regards to participation in decision making on wetland Ecosystem Services such as utilization, consumption, marketing and use of revenue from the sale of products particularly in male headed households, gender equity was reported by household respondents in this study.

From the field observation, the researchers found that it was only men who participated in decision making regarding community issues, for instance, who among community members should participate in the household survey conducted in this study. Therefore, the study concludes, there is a higher chance that this may also apply to the households’ decision-making. It roots for conducting separate focus group discussions (FGDs) constituting different gender groups to get more insight on decision making at household level.

Conclusion

Evidently, although Mara River Basin

wetland ecosystem in Kenya and Tanzania is very important in supporting livelihood and economies of communities living near it, the wetland faces great threats such as over-exploitation of wetland resources and agricultural expansion.

Now, the researchers are rooting for an integrated management approach to increase the economic valuation of the ecosystems for the sustainability and for the benefits of the local communities.

They also advocated for awareness raising and capacity building through a variety of tradition-based approaches and a need to revise the existing policies, institutions, interventions, and processes, to enhance gender equity within the management of water, land and ecosystems.

The need for close collaboration with relevant partners, stakeholders and effective advocacy on the importance of valuation at the appropriate time and place was also strongly encouraged.

LAKE IN PERIL:

Communities Struggle to Survive as Egypt's Lake Burullus Shrinks

IN THE middle of Lake Burullus, it is sometimes deafeningly quiet. There are no rustles of the trees in a forest and no highway traffic noise.

But this tranquility could soon be a thing of the past. Reason? The lake, located in the Egypt's Nile Delta, is steadily reducing in size due to increasing land reclamation around it, according to a new study.

The threats were documented by researchers at Ain Shams University in the study that assessed economic values of this natural resource in Egypt's Kafr El Sheikh Governorate.

Prof. Dr. Aly El Bahrawy, of the Faculty of Engineering, Irrigation and Hydraulics Department led the research that involved three professors and satellite images and GIS experts.

In their May-July 2015 study, it was reported, according to literature, that the Lake area shrank from 430 km² in 1973, to about 246 km² in 2011 with a total loss of 184 km² (42.8%) due to illegal activities. Such illegal activities, according to the study, include:

- Removal of large quantities of sand from dunes;
- Land reclamations of shallow parts for agriculture and fish farms activities;



- Unwise urban development;
- Construction of an international highway which cuts through the sandbar.

Burullus Lake

Burullus Lake is located within the districts of Baltim, El-Hamoul, El-Riad, Sidi Salem and Metobes in Egypt's Kafr El Sheikh Governorate, one of the largest Governorates in the Nile Delta.

Shaped roughly like a rectangle, according to the team analysis, Lake Burullus is about 60-70 km in length, with an average width of 11 km and surface area of 350 km². Differences are estimated due to timing, type of images and techniques used,

It is separated from the sea by a strip of land covered with sandbars and sand dunes of different width and height. The barrier tapers from



about 4 km width in the West to about 1 km in the east, near the lake outlet at El-Burg.

Lake Burullus was declared a protectorate by the prime ministerial decree 1444/1998 and in 1998; it was approved as a Ramsar site in Egypt.

Other Challenges Facing the Lake Ecosystem

The assessment study recorded deterioration in the Lake Burullus water over the past years.

This was blamed on the huge amount of daily bypassing of untreated or partially treated sewage water from the villages and towns around the lake; industrial dumping and uncontrolled agricultural waste water through drainage channels.

Lake Burullus also faces the great threat from fish farming and illegal

fishing practices. According to the assessment study, profitability of the fish farming encourages people to dry parts of the lake, transforming such areas into fish farms.

Also, some fishermen catch high-value fish fries at the lake inlet in Bougaz and sell them to the fish farms which negatively impacts on the fish stocks in the lake.

The researchers also note that fish farms are affecting the lake's water quality as they discharge their polluted water with high ammonia content into the lake, causing increase of the area covered by vegetation near the fish farms and raising the elevation of the lake bottom. Other documented illegal practices include fishing during the three banned breeding months which affecting the fish stock in the lake; the use of illegal sailboats and fishing without licenses.

Also noted as a threat to the lake's ecosystem are the increase of reeds and uneconomic plants around the lake.

According to the study, this is: "Reducing the actual area of the lake usable for various useful activities, decreasing the current circulation and the fish stock in the lake, and thus affecting the population's income."

All forms of bird hunting were declared illegal after Burullus was made a Protectorate. However, there are still some illegal practices of hunting around the lake. The research attributes this to poverty, tradition, lack of environmental and legal awareness, and insufficient law enforcement.

Writing in the final report, the researchers also note that climate change has led to temperature increase and sea level rise which increases the inflow of saltwater.

An increase of sedimentation is also foreseen from upstream. In addition, the study stresses that unwise human activities are causing, “erosion that reduces the possible protection by the sand dunes, decreasing the protection against sea level rise and salt intrusion.”

Current Status of the Existing Ecosystem Services

Agriculture and livestock: Writing in their final report, the researchers indicate that, “The only profitable crops, guava, berseem and dates are intensively cultivated on the eastern side of the inlet, near Baltim.”

Other crops grown near this lake include rice, cotton, tomatoes, grapes, clover, cabbage, cauliflower, watermelons, broad beans, wheat, rice, and maize.

According to the study, the average yield of rice and cotton is about 60 percent and 40 percent of the national average, respectively.

Villagers around the lake also keep herds of buffalos, cows, sheep, goats and camels inside the Protected Area, the study found out.

Fisheries and fish farms: The study notes that fishing is considered one of the main activities in the protected areas, providing the principal life-support system for the local communities, fishermen, fish merchants, fish brokers, ships and fishing tools manufacturers.

Unfortunately, “the annual fish catch in the lake has decreased from 53,909 tons in 2005 to 49,704 tons in 2013.” The main problem, however, is the disappearance of some marine species of economic value.





Fishers interviewed in this study, attributed the disappearance of high value fish caught in this lake to the decrease of lake fertility.

Economic plants: Plants around and within the lake are classified into six major categories: fodder (grazing), fuel, medicinal use, human food, timber and reed harvesting. The study discovered that various plants are used for making mats, baskets, ropes, chairs, ornamental uses, beach bed, sand binder, soap manufacture and oil and dye extraction.

Although Lake Burullus seems to be undergoing immense change due to human activities, several species of local and migratory birds still exist in the lake's ecosystem.

But what is worrying is that, even though all forms of bird hunting are illegal after the declaration of Burullus as a protectorate, illegal bird hunting still goes on unabated according to the study. The most hunted birds are coturnix quails in autumn and water birds in winter.

Salt marshes: The researchers note that salt marshes extend along the lowlands of the lake marine bar, with an area about 40 percent of the total area of the bar, 6 percent found in the eastern part, and 34 percent in the western part due to the relative low level of its surface. And tidal action is considered among the principal factors responsible for the formation and development of salt marshes.

Gender and Equity Status

The assessment study found that the activities performed by the population at Burullus Lake vary according to the availability of the ecosystem services. These activities include fishing and fish farms, fish trading, ship building and repair, reed cutting, agriculture, bird hunting and tourism activity.

However, there are discrepancies in the contribution of women and men in each activity. Mainly the muscular or risky tasks are only performed by men and boys – only in their spare time—like fishing, bird hunting and ship building and maintenance. On the other hand, the home-oriented



tasks, or the ones requiring limited mobility, like reed cutting and processing are done by women in the villages.

Interestingly, the study discovered that fish trading and agriculture activities are carried out by the whole family but women have limited access to the revenue generated. And also women are not engaged at all in any committees or organizations seeking for community development, according to the study.

Fishermen suffer from environmental problems represented by the deterioration of the lake which affects the fish quantity and quality. The nature of their job affects the health condition and they have to quit at early age. This is according to the study.

Most of the fishermen's sons give up fishing due to the poor benefits acquired in this industry. Women complained of unemployment of their children despite the high expenditure on their education and unstable income.

The fact that fishers gain their income on a daily basis, the study notes, leaves them with no health insurance



and pension, which threatens the whole family. And in these communities, "women don't have any income and rely on their husbands to make their living."

Suggested Solutions

Looking forward, the study roots for support to fishers from the Egyptian Government, stakeholders and fishery committee as fast actions to take their rights.

The researchers also call for boosting of cooperation between stakeholders in the management of

Burullus Lake and involving of NGOs in enhancing its ecosystem services.

In addition, it was recommended that the responsible bodies should have a management plan to control reed expansion since it adversely affects other ecosystem services of the lake.

In the face of pending ecological disaster, the researchers recommend that: "The restoration plan is needed urgently for the lake ecosystems for improving water quality and ensuring a regular monitoring program of the lake by involving all stakeholders in lake management plan."



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