



In brief:

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2. *KMFRI steals the show in a mega event*
3. *Plans to build proposed wastewater treatment plant for Mikindani residents kick off*

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#LakeTurkanaFishery #SurveyFindings
@KmfriResearch

Lake Turkana fishery risks collapse, thanks to wrong fishing practices

Lake Turkana fishery faces the risk of collapse due to wrong fishing practices and use of wrong fishing gears, Kenya Marine and Fisheries Research Institute (KMFRRI) latest research has established. There is little supply of fish due to overfishing in the lake, especially in the Ferguson's gulf for Tilapia. Since November last year to March this year, KMFRRI research scientists based in L. Turkana have been conducting a study of the lake.

The overall objective of KMFRRI's study was to undertake fish market survey and analysis to provide information for sustainable management of the lake's fishery.

The survey found that, in the last five months, fish from L. Turkana has not been reaching Kitale and Eldoret markets, giving a window of opportunity for fresh fish from Jinja, Uganda, to penetrate the Kenyan fish market, particularly Eldoret Fish Market.

According to the survey in the past five months, the fish trade in the area has declined due to low Tilapia harvest from the lake. Undersized Tilapia being caught fetch low prices when it reaches the market, hurting residents' livelihoods.

Tilapia fish from L. Turkana is becoming a rare commodity in Eldoret Fish market. And although Kitale



Top, Turkana-based KMFRRI researcher Mr. Casianes Oililo interviews Chairman of Lodwar fresh fish market at Lodwar market. Bottom, empty drying racks, an indication of declining staple Tilapia fish from Kalokol and Kerio landing beaches.

Fish Market has some Tilapia from the lake, they are small in sizes, hardly 18cm in length.

The decline in fishery may be attributed to the increasingly low fish production, where Tilapia and Nile Perch fish are continuing to disappear from the market. The largest nearby fish market is in Lodwar, the capital of Turkana County. Although some fish are also sold in other parts of the country, such as Kakuma and Kalobeyei, fish from L. Turkana also find their way to Eldoret, Nakuru and Nairobi, as well as the Democratic Republic of Congo (DRC).



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From July last year to March this year, a team of researchers from KMFRI Turkana station carried out fish market survey for fishery from the lake to Lodwar, Kitale and Eldoret fish markets to determine the state



Turkana-based KMFRI research scientist Mr. Maurice Obiero inspects drying fish, which are usually dried before frying.

in which fish is processed, stored, distributed, sorted, marketed and sold to consumers.

The aim of the survey was to assess fish market linkage from Kalokol to Lodwar, Kitale and Eldoret, and use the data to rate the Turkana market. Besides livestock, fishing offers an alternative source of livelihood for communities living along Lake Turkana region. The survey also established that fish trade is female-dominated with 90 percent of traders being women, and men 10 per cent.

KMFRI researchers found that in both Lodwar and Eldoret, fish is processed and added value in the local markets using various methods to increase demand and boost profits. They further learnt that the prices depended on the quantities of fish sold and seasons.

The findings further reveal that fish trade has created jobs for many people, with Eldoret fish market employing over 150 fish traders, each hiring between 2 and 6 workers daily. This implies that fish markets are major employers in the Turkana County.

Fish market in Kenya is expanding and becoming popular due to the increased production of fish in freshwater systems, marine systems and aquaculture.

The capture fishery still leads in production registering over 300 metric tonnes per annum, followed by coastal marine at over 27,000 metric tonnes per annum. Aquaculture comes third with slightly over 15,000 metric tonnes, a drop from over 25,000 metric tonnes per annum recorded in the past five years.

In view of the fishery production and to reverse the decline of fishery resources in L. Turkana, KMFRI researchers recommend urgent measures that include building capacity of fisher folks, fish traders, the private sector, among other major players in the fishery sector. This will enhance sustainable fish production and trade around the lake.

Following the findings, KMFRI researchers recommended development of stringent measures to enforce fishery regulations in Monitoring, Control and Surveillance (MCS) of L. Turkana fishery by the county government.



Customers buy fresh fish and traders taking interview from KMFRI scientists in Eldoret fresh fish market in March 2023

The results will be achieved by building strong public-private partnerships to enhance fish industry around the lake; and articulating a strong market linkage between fish producers and traders in the sustainable management and supply of fish in the Turkana enclave.



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KMFRI Kisumu centre participates in mega events, set to promote tourism in the county

The Fish Fiesta 2023

Kenya Marine and Fisheries Research Institute (KMFRI) Kisumu station joined other stakeholders in commemorating the Fish Fiesta 2023, which was hosted by Kisumu County from the 6th to 9th of April 2023 at the Dunga Hippo Point Public Beach in Kisumu City.

The Fiesta brought the best of Kisumu to the World. The theme for the event was "Kisumu My Pride" under the platform -Kanda La Ziwa. The event was organized by Kisumu County Government under the Department of Trade, Tourism, Industry and Marketing with the aim of promoting tourism within the County as well as creating awareness of alternate income-generating activities that the locals can engage in so as to sustain themselves. Kisumu is strategically positioned complete with a lake, providing excellent opportunities for Lake Tourism, Marine Transport, and Water Sports.

The event was marked by activities such as a Boat Race, Miss Tourism, Mr Tourism, Mr Flex, Mr Strong, Tug of War, Photo Competition, Beach Volleyball,

Entertainment, Kids Fun Fair, Exhibitions, Symposia,



Kisumu Governor Hon Anyang' Nyong'o leading in the clean-up

Medical Camps, and Fire Works. The Mega Fiesta event was preceded by a "World Earth Day Clean-up" activity which was graced by Kisumu County Governor Hon Prof Anyang' Nyong'o. All friends of Lake Victoria came together to clean up and plant trees at Nanga Bridge- Kapuothe along River Wigwa.



The World Earth Day activities were a build-up ahead of the main event - Fiesta 2023.



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Besides KMFR, several other partners sponsored the event and they included; the Council of Governors, KMFR, Kenya Wildlife Service (KWS), Lake Basin Development Authority (LBDA), Kenya Maritime Authority (KMA), Kenya Institute and Research Development Institute (KIRDI), Tourism Regulatory Authority, Tourism Fund, Lake Region Economic Bloc, Lake Victoria Tourism Association, Kenya Association of Manufacturers, Chamber of Commerce, Sight savers, USAID Empowered Youth, Amusement World, Homeboyz Group, and Sema Pay Services among many partners and collaborators.



Principal laboratory analyst walks a client through various laboratory equipment being showcased.

The KMFR laboratory team showcased services including Molecular, Biological and Microbiology laboratories. Molecular diagnosis is the modern world way to go in marine and freshwater research investigations of fish barcodes, microbial genomes and other biological research activities. In the biological and microbiology laboratories, researchers are able to identify zooplankton, phytoplankton, algae, and sponges among other aquatic microorganisms using microscopic investigation.

Kenya Lake Debris Voluntary Program showcased garbage collection, waste management (waste

segregation and management) and proper waste disposal.

The attendees were also sensitized on how to keep



KMFR team segregating garbage after clean up

Kisumu county clean by properly managing waste using the 5Rs: Reuse, Recycle, Reduce, Refuse, and Repurpose. There was also a freshwater aquarium



Sample of fish oil displayed at the event

from KMFR where different species of fish were displayed in a glass aquarium. The species of fish were



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Goldfish, Nile Tilapia, *Labeo*, and *Haplochromis* among others.

Post-Harvest Analysis and Natural Resources team also had the opportunity to exhibit their products in the fish fiesta event. Here, different products made from fish, fish waste and fish by-products were displayed to make the day colourful. The products were fish oil, fish flowers made from fish scale, omena biscuit, and fish gelatin, among others.



Omena biscuits sample displayed at the event



The Lake Victoria Day, 2023

Kisumu County also celebrated Lake Victoria Day from the 12th to the 14th of April 2023, right after the Fish Fiesta, which brought together stakeholders from all over the country. The event which was held at Korowe – Jumbo, in Kadibo Sub County was themed *Livelihoods and Opportunities: Our Climate, My*

Responsibility. It highlighted matters climate change, blue economy, cage fishing, rivers and catchment protection, and human and wildlife conflict. Like the Fish Fiesta, Lake Victoria Day targeted to promote tourism in Kisumu County and create awareness of alternate income generation activities within the county.

KMFRI Kisumu centre was an organizing partner and was not left behind in participating as various departments exhibited their products. The Post-Harvest Analysis and Natural Resources department showcased products made from fish, fish waste and fish by-products. The products included fish oil, fish flowers made from fish scale, Omena biscuit, and fish gelatin among other products.

The Maritime Department sensitized the locals on the Blue Economy and Freshwater research activities being done in Lake Victoria using the Research Vessel *Uvumbuzi*. The engagement sought to promote Blue Tourism through participation in recreational fishing, a sport whose potential remains underexploited within



Visitors onboard KMFRI Research Vessel Uvumbuzi

the lake. Kenya Lake Debris Voluntary Program (KLDVP) led by Research scientist, Patrick Otuo exhibited garbage collection, waste management and proper waste disposal. The laboratory department represented by Principal Laboratory Analyst, Teresia Wacira showcased different services including molecular, biological and microbiology laboratories.



BY: BRIAN ISOE Edits: Steve Mwangi, Jane Kiguta and Phionalorna Nzikwa
#ConstructedWetlands @KmfriResearch

KMFRI's raw sewage treatment plant project set to boost Mikindani residents' environmental health, agriculture



Mombasa County DG Francis Thoya on a site-seeing mission at Mikindani, where the wetlands will be constructed

Mikindani residents in Mombasa County are set to reap big from a proposed constructed wetland wastewater treatment technology that will be set up to clean raw sewage from the area, and use it for irrigation. The news was announced during an inception meeting with stakeholders who included Mombasa Deputy governor, county executive committee members, KMFRI CEO Prof James Njiru, Go-Blue project manager, Mr Ali Mwanzei of Jumuia ya Kauti za Pwani (JKP), National Environment Management Authority (NEMA) Director General representatives Dr Kennedy Ondimu, Mombasa Water Supply & Sanitation Company Limited (MOWASSCO)

representative Dr Gerald Bosire, Mikindani MCA Hon Madialo, area chief and community members.

The discharge of wastewater from Mikindani into the Indian Ocean has raised concern among stakeholders, and hence the intervention by Kenya Marine and Fisheries Research Institute (KMFRRI) to implement the project that will save the ocean and benefit the local community in the area.

The project principal investigators are KMFRI's senior research scientist Mr. Stephen Mwangi and Assistant Director for Oceanography & Hydrography Dr. Joseph Kamau. The top highly seasoned research scientists are leading the project to ensure the wastewater treatment system is fully implemented and its objectives met.

The Constructed Wetlands (CWs) classified as green infrastructure, are shallow-water ecosystems that mimic natural wetlands. They are man-made engineered systems that use natural functions such as vegetation, soil, and organisms to treat municipal or industrial wastewater and greywater.

Properly built, maintained, and operated CWs can effectively remove pollutants and bacteria associated with municipal and industrial wastewater. CWs are effective in wastewater treatment, and operating costs are lower by 50 to 80 percent compared to conventional systems. The technology is also environment-friendly.



Image showing how sewage is discharged into the Tudor Creek waters in Mikindani



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KMFRI is tasked with keeping the marine ecosystem clean and devoid of contaminants, and the discharge



Left, treated water at the Shimo La Tewa constructed wetland Right, how they are using the water for irrigation

of raw sewage that has not been treated poses a threat to the marine environment. This plant is therefore set to improve the water quality by removing all contaminants including potentially pathogenic bacteria in the raw sewage before use and release into the Indian Ocean. The already treated water that has gone through all the stages of purification will not harm the residents or marine organisms in the water bodies.

“We have done this before and I want to assure you that the treated water will be safe for our farmers to carry out agriculture and even aquaculture. The water will meet the standards set by the National Environment Management Authority (NEMA), and there is no cause for alarm as our scientists have looked into all the elements and factors and put them into consideration before ascertaining that the water can be used or is safe to be channeled to the ocean,” says KMFRI CEO Prof James Njiru.

The two-year project is funded by the European Union (EU) to a tune of about Sh40 million through the United Nations Environment Project (UNEP) under the GO Blue project. This is a replication of what KMFRI has successfully piloted in Shimo la Tewa prison before in an effort geared to reduce pollution of the ocean which harms the marine environment, improve Mtwapa water creek quality, as well as raise the sanitation standards in and around the prison.

Fish and other marine organisms cannot survive in a toxic and polluted environment. Wastewater will create

a dead zone in the waters that may lead to massive deaths of aquatic organisms as oxygen levels will drop. Treating this sewage means healthy environment for marine organisms, ensuring their breeding grounds are not contaminated, and their oxygen is pure for their uptake.

Runyuu, the designated place, has been affected by wastewater effluent discharge for a long time and this initiative will go a long way in helping the local community as sewage and flood water will now be well managed for the benefit of households in Runyuu and the neighbouring area of Giriamani.

Residents who have been negatively impacted by the flow of this sewage will continue receiving technical advice from KMFRI experts and from other partners involved in the project implementation, and even after its completion. Dr Kamau says the project is a big win for the community as most of them have been using untreated sewage to irrigate their crops, oblivious of the harm it poses to their health.

“This raw sewage carries with it a lot of bacteria from the medicine we consume to the oil we smear our bodies with. All this gets into the sewage and once we use this water again to irrigate our crops, we directly or indirectly endanger ourselves and even the marine organisms in the ocean where the untreated sewage



How sewage flows through the Mikindani estate area

will eventually drain into,” says Dr. Kamau.



For his part, Mr. Mwangi emphasized the need to train the community on the operation and maintenance of the constructed wetland system so that its sustainability is achieved in the long run. The implementing team assured that the constructed wetlands are cost-effective, easy to manage, and the wastewater will flow through the system by gravity.

Mikindani area has in the past been affected by landslides occasioned by rains and poor soils. This intervention will therefore act as a barrier to the landslides witnessed in the area that have been wreaking havoc on the locals. The initiative will also seek to cushion the people from the damaging effects of the natural calamity by reinforcing walls on the perimeter, and growing vetiver grass which is effective in holding the soil together in areas prone to erosion like Mikindani.



A photo illustrating how the landslides have affected the Mikindani area

This initiative is therefore instrumental in safeguarding lives, and KMFRI through the project investigators are looking into the possibilities of incorporating waste from the hospitals to treat it before it is released to reduce hazards it poses to mankind and the marine ecosystem.

Development of master plan kicks off

KMFRI team is already developing a concept master plan for the construction of the wastewater plant. The plan captures the set-up of the technology.

While surveying the site and taking measurements at the proposed construction site accompanied by Dr Kamau, Engineers Dickson Aloyo and BK Ruto, and community members on Friday 19th May, 2023, Mr Steve was upbeat that the project will be a success.

Using a drone, Eng Ruto took an aerial view of the site to develop the diagrammatic representation of the plant. A topographical survey of the site is underway.

In the meantime, raw sewage continues to flow under makeshift bridges commonly used by residents and pupils as they grapple with stench from the streams.

Healthy maize plants in nearby farms are a clear testimony that the cleansed effluent will boost farming if properly used.



KMFRI team led by Senior Researchers and co-PIs Mr Steve Mwangi and Dr Joseph Kamau, engineers and community members at the proposed construction site.



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Pictorial Page

Compiled By: Brian Isoe & Jane Kiguta



Top, KMFRRI marine pollution research expert Dr Eric Okuku during a beach cleanup in along Shimoni beach. Bottom, KMFRRI team weighing collected trash.



Used diapers floating on the shores of the ocean in Shimoni



Wasini Primary School pupils pose for a photo during the launch of marine litter campaign dubbed 'Don't be a Litter Bug Use Less Plastics' organized by KMFRRI



Kwale residents actively participate during the launch of a marine litter campaign in Shimoni, Kwale County.



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KMFRI staff with officers from the Kenya Fisheries Services (KeFS) who were on a benchmarking tour to our institution.



Students from five different schools in Ganze constituency sample seedlings donated by KMFRI in an initiative aimed at increasing forest cover to curb the adverse effects of climate change.



Students from the Technical University of Kenya in KMFRI's auditorium follow a presentation by research scientist Dr. Victor Mwaka during the students' tour of the institute.



KMFRI staff prepare samples collected in the ocean



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Rukia and Monica sorting Black Soldier Fly (BsFI) post larvae so as to start a new BsFI colony



Mariculture team during a fish pond cleaning exercise. During this exercise, fingerlings are also harvested.



KMFRI's Assistant Director Dr Joseph Kamau and interns from his department pose for a group photo after drawing racked tiles from the ocean before the onset of data analysis.



KMFRI's Assistant Director Mariculture Dr David Mirera and the Japanese ambassador to Kenya during an engagement meeting with beach management units (BMU) from Mtwapa creek.