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BY BOAZ OGOLA OHOWA & JANE KIGUTA
@KmfriResearch #Governance

Lack of effective policies exacerbating Kenya's marine pollution

Environmental pollution problem has been attributed to, among other reasons, lack of effective policies and, or, failure to implement existing policies and regulations governing pollution and waste management in general. This was revealed following the completion of an evaluation carried out to establish the effectiveness of environmental legislations and policies in managing Kenya's marine and coastal environments pollution.

The assessment provides an insight into the impact of the regulations on the ecosystems of ecological and socio-economic significance.

Kenya has a robust environmental legislation spread over a number of legal statutes governing an array of environmental issues. The Environmental Management and Coordination Act (EMCA, 1999), passed in January 2000, is the umbrella law established for the purpose of achieving the harmonization and implementation of the environmental management laws.

Under the Act, the National Environment Council (NEC) has been established, the functions of which include policy formulation and direction. Also established under the Act is the National Environment Management Authority (NEMA), whose role is to exercise general supervision, coordination, and



Plastic waste washed to the shore in Kwale County

implementation of all policies related to environmental issues.

Besides national legislations, Kenya is also a signatory to a number of important regional and international environmental treaties and conventions geared towards coastal and ocean management.

The Nairobi Convention, covering Eastern Africa and the Western Indian Ocean, deals with the protection and management of the marine and coastal environment. The United Nations Convention on the Law of the Sea (UNCLOS) has an array of provisions relating to the prevention, reduction and control of pollution of the marine environment by oil and other hazardous substances.

Kenya Marine and Fisheries Research Institute (KMFRI) is a major stakeholder in the implementation of the environmental legislations given her critical role in marine research. The Institute is mandated to undertake research in, among others, environmental and ecological studies – which encompasses pollution



monitoring and management. Additionally, KMFRI researchers through KMFRI's marine debris volunteer group, have been organizing and carrying out beach clean-up activities, with a view to ridding the beaches in the vicinity of the institute of plastic debris. In a bid to boost these efforts, KMFRI scientists have developed a mobile application called 'TakaConnect'. It is hoped that once it becomes operational, it will drastically improve the amount of waste collected because it will connect waste collectors with recyclers who will buy the trash.

The effect of environmental policies on marine ecosystems is therefore important in informing KMFRI's research activities.

Environmental policies evaluation...

The evaluation of effectiveness of an environmental policy or regulatory regime involves consideration of two overarching issues. The major one is institutional effectiveness, which refers to the extent to which the output of the policy matches the intended policy objectives.

For instance, does the number of environmental permits issued, that is, output effect, reflect the state of the environment or policy objective and performance? The other issue is 'impact on ecological or environmental effectiveness', defined as any effect that influences the ultimate outcome of the policy issue.

The evaluations are often linked to the use of specific set of instruments, defined as the resources necessary for the attainment of policy objectives. These instruments are accompanied by other components such as staff, finances, administrative structures, training, and other resources dedicated to the design and implementation of a measure. Evaluation therefore involves an assessment of those instruments in the policy context in which they are applied.

Thus, institutional effectiveness should not be mistaken for policy effectiveness, as the ultimate

effectiveness evaluation is impact effectiveness. The latter has a direct relationship with policy performance, and can only be achieved if the necessary instruments are in place.

Why evaluate policies effectiveness?

Kenya's marine and coastal environment is endowed with living and non-living natural resources that are of enormous ecological and socioeconomic significance. They include mangrove communities, seagrass beds, coral reefs, fisheries and sandy substrates. These aquatic resources exhibit varying degrees of sensitivity and vulnerability to the adverse effects of pollution, which tend to undermine their role in boosting ecosystem health.

Oil pollution

Oil is a mixture of many hydrocarbon compounds with varying physical and chemical properties such as water-solubility, toxicity and environmental persistence. Consequently, oil possesses a multi-pronged lethality, eliciting an array of deleterious effects across a wide range of species and habitats. Oil pollution has the potential to pose a significant threat to marine and coastal resources, in particular the fisheries, aquaculture and mariculture sectors.



Mangroves



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Mangrove habitats suffer both lethal and sub-lethal effects from oil exposure, ranging from subtle responses such as germination failure, decreased canopy cover, enhanced sensitivity to other stressors, to seedling mortality and compromised growth rates. Oil has minimal direct effect on seagrass beds and coral reefs since they are mostly submerged. However, the use of dispersants and other chemical agents in treatment of oil spills has been shown to exacerbate the negative effects of oil on these ecosystems.

The government, for instance, is leveraging fisheries to boost food security and enhance the blue economy sector. But to achieve this, there is need to mitigate marine pollution, which in most cases emanates from land-based activities and maritime oil pollution, to sustainably manage the sector, and for socioeconomic posterity.

Land-based sources of pollution

Land-based activities resulting in the discharge of municipal, industrial and agricultural wastes and terrestrial run-off account for about 80 per cent of all marine pollution. Sewage and waste water discharge, nutrients, heavy metals, organic pollutants such as pesticides, oils, sediments and plastic debris, discharged by rivers or directly from terrestrial run-off into coastal waters, lakes and other water bodies, pose adverse effects on aquatic ecosystems as well as human health and well-being.



Litter on the shoreline of Ungwana-Malindi Bay



A pile of garbage at Mwakirunge dumpsite in Mombasa

Eutrophication, a consequence of excessive input of nutrients to the aquatic systems, represents a serious threat to the integrity of the ecosystems and the resources they support, such as fisheries. Proliferation of harmful algal blooms (HABs), a consequence of eutrophication, has been associated with degradation of water quality, destruction of economically important fisheries and public health concerns.

The other serious global problem with the potential to jeopardize the sustainability of the blue economy dream is trace element contamination in aquatic ecosystems. Land-based industrial activities such as mining, textile and paint manufacture, agriculture, and domestic effluents, among others, have collectively contributed to the increased trace element load.

Some of these elements are essential for life at lower concentrations, but others such as lead, mercury, cadmium and arsenic are highly toxic to organisms above specific threshold concentrations. The associated hazards are exacerbated by the fact that these elements exhibit long biological half-life periods otherwise known as environmental persistence, and are bioaccumulative carcinogens and teratogens.

Plastic pollution has become a serious concern globally, with plastic debris being the most pervasive form of anthropogenic litter in oceans and freshwater systems worldwide.



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A good proportion of marine plastic debris originates from land-based sources, with streams and rivers being the main transport pathway. Plastic fragments such as microplastics contain toxic chemicals which are swallowed and ingested by aquatic organisms and mammals. The transfer of these toxicants into aquatic biota, and the effect on the base of the food web can have knock-on effects for trophic structure and ecosystem functioning.

The presence of microplastics has been reported in the gastrointestinal tracts of commercial fish species and in the human lung tissue. Respiratory symptoms and disease following exposure to occupational levels of microplastics within industry settings have also been reported. Thus a combination of ecological, economic, human health and aesthetic damages are associated with marine plastic debris.

Given the persistence of plastic in the environment, with half-life periods in terms of hundreds of years, the problem of plastic pollution affecting all environmental compartments – from marine and freshwater bodies, soil, food, drinking water and air – remains a sticky issue.

The sandy beaches along the Kenyan coastline are critical for tourism development due to their exceptional aesthetic value. Tourism is one of the major foreign exchange earners for the country. Despite this important function, the beaches are quite vulnerable to oil and plastic pollution.

Littering sandy beaches with tar balls and plastic debris is aesthetically distasteful to tourism, and hence have the potential to jeopardize the expected socio-economic gains.

Thus the ultimate effects of these challenges, unless curtailed by implementation of effective policies, could pose a serious threat to the achievement of the intended ecological, socioeconomic and other benefits.



Plastic litter on the shoreline of Malindi-Ungwana Bay beach shoreline.

Interventions so far

Many countries have enacted national policies to address plastic pollution, instituting import bans, penalties on plastic use, improvement to recycling infrastructure, and change in public discourse on excessive plastic consumption.

Policy approaches geared towards reduction or complete elimination of plastic production and use, have been proposed given the urgency of finding a lasting solution to the problem of plastic waste. At the national level, Kenya's ban on single-use plastic bags in 2017 and the presidential directive banning single-use items in protected areas are two memorable policy instruments.

The global nature of plastic pollution in the ocean therefore requires cooperation from governments, producers, consumers, researchers, civil society, among other groups. However, by virtue of their core regulatory powers, governments have a critical role to play in helping to solve this problem.



BY MR PAUL KIMANZI, MS JANE KIGUTA & Dr MELCKZEDECK OSORE

@KmfriResearch #DisabilityMainstreaming

KMFRI explores partnership possibilities with Kenya Society for the Blind to empower visually impaired

The welfare of the visually impaired was at the center of partnership talks that happened in May 2022 between senior management of Kenya Marine and Fisheries Research Institute (KMFRI) and Kenya Society for the Blind (KSB) at KMFRI, Mombasa headquarters.

The talks that were spearheaded by the Deputy Director in charge of Human Resource and Administration Dr. Irene Githaiga, on behalf of KMFRI management, focused on potential areas of partnership that would help in the prevention of avoidable blindness for the members of the staff. KSB was represented by the Executive Director Mr. Samson Waweru, who was accompanied by his team comprising of Mr. Johnson Riungu-in charge of Education and Rehabilitation, and Ms. Annah Kiilu, from the Advocacy and Corporate Affairs department.

Other mutually beneficial areas discussed included the provision of training opportunities for KMFRI staff to be facilitated by KSB which will focus on the welfare of visually impaired communities, provision of assistive devices (visual aids), and consultancy services. KMFRI has aggressively embarked on mainstreaming disability at the workplace in accordance with the Persons with Disability ACT No. 14 of 2003.

In recognition of the fact that anyone can acquire a disability at any time, the Institute is determined to leave no one behind whether staff, partners or customers that visit the premise. It is in this regard that KMFRI management has been in the forefront to



support construction of ramps for users of wheelchair and crutches, introduction of braille for the visually impaired at the Customer Care Department and the acquisition of various assistive devices for use by people who are differently abled.

The KSB team agreed to establish a working framework that captures the terms of engagement with KMFRI and will present it within two weeks to allow for additional deliberations.



Director Ocean and Coastal Systems Dr James Mwaluma welcomes KSB team to KMFRI.

KSB mobilizes resources to support the visually impaired. Mr. Waweru appealed to KMFRI to factor in the blind in its Corporate Social Responsibility activities, Employment as well as economic



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empowerment through the access to government procurement opportunities (AGPO).

The partnership will also enable KMFRI staff to benefit free of charge during eye screening medical camps. Ms Kiilu said that the officers will be advised on the next course of action if the screening detects a problem that requires further attention.



Kenya Society for the Blind (KSB) Executive Director Mr Samson Waweru receives a gift package from KMFRI's Deputy Director HR & Admin Dr Irene Githaiga

KSB is advocating for organizations to mainstream disability in the workplace and to train employees to understand disability issues to coexist with PWD.

KSB relies heavily on membership subscription fees. Ms.Kiilu suggested the body uptake corporate membership. Corporate and individual membership is open to all. Currently, the society has over 10,000 members.

Membership subscription fees are of paramount importance to KSB.



KSB's Ms. Annah Kiilu (Left), from the Advocacy and Corporate Affairs department receives a gift package

Way forward

KSB in collaboration with her partners is planning to conduct training at the Kenya National Library Service in Mombasa.

The objective of the training is to train visually impaired persons on how to access digital content through computers and assistive technologies, screen readers and screen magnification.

This will provide the necessary skills to persons with visual impairment to access government websites and services.

Following continuous improvement of accessibility and mobility at the KMFRI premise, including introduction of suitable infrastructure for ease of mobility and communication with people with various challenges whether visual, physical or otherwise, the Institute will be an ideal location for KSB to consider hosting such training in the future.



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BY PHIONALORNA NZIKWA, JANE KIGUTA & NANCY MWITI

@KmfriResearch #CollectiveActionForTheOcean

KMFRI joins marine and maritime stakeholders in marking the global UN World Oceans Day in June

It was pomp and colour as coastal residents marked the UN World Oceans Day, usually observed on 8th June every year. Kenya Marine and Fisheries Research Institute (KMFRI) was not left behind.

Members drawn from the Institute joined marine and maritime stakeholders in the celebrations that were characterized by a band procession and panel discussions, leaving no doubt that the society understands the crucial role of the ocean for their well-being.



Procession band gets ready

KMFRI occupies a strategic position in harnessing the potential of the Blue Economy through marine research, and the all-important day saw the institute



Procession for the World Oceans Day

participate in an array of build-up activities that included beach-clean ups in Watamu, Kwale County, ahead of the main celebrations.

The activities culminated in a procession on the D-Day that began at Nyali Centre, through Links Road Mombasa, leading to the Mombasa Beach Hotel where a major function was held to mark the day.

This event, which was organized by the civil society led by Mr Charles Wanarua, brought together stakeholders from KMFRI, Kenya Maritime Authority (KMA), Kenya Ports Authority (KPA), Kenya Coast Guard Service (KCGS) Kenya Wildlife Services (KWS), Kenya Red Cross Society, and National Environment Management Authority (NEMA) among others.

Additionally, KMFRI in collaboration with the Kenya National Commission for UNESCO co-hosted a virtual session to discuss critical issues touching on the health of the ocean.



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Awareness procession leading to Mombasa Beach Hotel

Other organizing partners that took part in the online forum that attracted more than 100 participants included Technical University of Mombasa (TUM), National Environment and Management Authority (NEMA), Western Indian Ocean Marine Science Association (WIOMSA), and the World Wide Fund for Nature (WWF) among others.

This year's theme - **Revitalization: Collective Action for the Ocean** - saw like-minded organizations take an active role in creating public awareness on the need to protect and conserve marine life and the Earth's major water bodies for the benefit of mankind.

It also highlighted the world's oceanic system and how it is affected by climate change through the rising pollution, acidification of ocean water, rising temperatures, and reduction in ocean biodiversity. The theme was therefore aimed at promoting knowledge on collective actions we all can take to restore the Ocean to its former glory.

The virtual forum

Speaking on behalf of the State Department of Fisheries, Aquaculture, and Blue Economy Principal Secretary (PS) Dr Francis Owino, during the virtual session, Secretary Administration SDF & BE Mr

Kassim Farrah urged stakeholders to take advantage of existing opportunities and bring together all actors to establish reforms and sustainable global ocean governance processes. "This involves building inclusive processes through concerted efforts to identify and involve vulnerable groups," said Mr Farrah.

In their detailed presentations, plastic pollution research experts and data management experts shed light on the status of marine litter in Kenya, putting emphasis on the role of data in ocean science, and the pollution mitigation measures rolled out by the government.

"Plastic is not a problem. The problem is that it is in the wrong places and on the environment. Our estimate from research is that around 37,000 tonnes of plastics are leaking into the marine ecosystem every year," explained Dr. Eric Okuku, who is a marine pollution research expert.

"About 31 percent of plastics found on our beaches are recyclable, opening up an opportunity to use these plastics as a wealth generation resource for communities," he concluded.

Kenya Marine and Fisheries Research Institute, National Commission for UNESCO and UNESCO Regional Office for Eastern Africa invite you to a virtual event to celebrate World Oceans Day 2022.

Theme: Revitalization: Collective Action for the Ocean

Date: 8th June 2022

Time: 0830 - 1140 hrs East African time

Goal: Highlighting local ocean adjacent communities, ideas and solutions that are working together to protect and revitalize the ocean and everything it sustains

Join Zoom Meeting
<https://us06web.zoom.us/j/84306192301?pwd=sa0jJDENdmltZkFUKQwkbNabEzPdz09>

Meeting ID: 843 0619 2301

Passcode: 497314



World Oceans Day webinar announcement poster



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Addressing journalists on the sidelines of the virtual session, KMFRI Director General Prof James Njiru said the UN proclaimed 2021-2030 as the Decade of Ocean Science to reverse the decline of ocean resources. He added the move was timely because the announcement came at a time when the world is addressing issues of the ocean and the crucial space it occupies for sustaining aquatic life and people's livelihoods globally.

The theme of the decade 'Science We Need for the



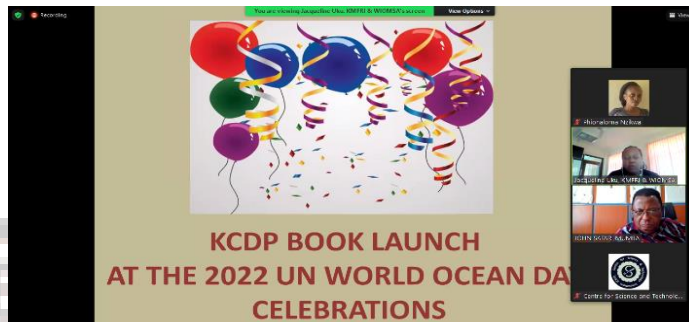
KMFRI CEO Prof James Njiru during a media briefing

Ocean We Want' therefore resonates well with this year's World Oceans Day theme in revitalization and taking collective action for the ocean.

The 2022 UN Ocean Conference, co-hosted by the Governments of Kenya and Portugal, will take place on 27 June – 1 July 2022, in Lisbon, Portugal. The overall theme of the Conference is: "Scaling up ocean action based on science and innovation for the implementation of Goal 14: stocktaking, partnerships and solutions".

KCDP Book launched

During the eventful forum, the Kenya Coastal Development Project (KCDP) book titled "From Ridge TO REEF - A Legacy for Sustainable Coastal Development in Kenya" was launched. The book details activities and projects implemented under KCDP, a five-year World Bank funded project that was anchored by KMFRI, among other implementing agencies, and which was concluded in 2017.



KMFRI Board of Management Chairman Hon. John Safari Mumba, who was also present during the virtual forum, led KMFRI team in launching the book.

The book provides an avenue for dissemination of policy and offers guidance on various Coastal issues from the work undertaken under the mandate of different agencies and collaborators.

KMFRI shines at the exhibition

While displaying some of her research work at the exhibition stands set up by the event organizers, KMFRI was delighted to share information about her research activities with participants attending the function. KMFRI used the opportunity to create awareness about her products to participants who visited her exhibition stand.



KMFRI's exhibition stand was a beehive of activities

The colourful event at the Mombasa Beach Hotel was a joint effort of stakeholders in the Blue Economy. Other entertaining activities that took place at the event included sports diving, lifesaving sport, jet ski wave and swimming sports, among other water-related games.



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KMFRI intern Ms Nancy Mwititi attends to a customer visiting the Institute's exhibition stand.

The participants had earlier paraded ceremoniously on Links Road in Nyali, Mombasa towards the Mombasa Beach Hotel where they assembled for beach cleanup activities on the shoreline. Some 115kgs of litter was collected.

Speaker after speaker at the event urged people to take care of the ocean for posterity of future generations, underscoring the important role of the ocean in creating jobs. The speakers, representing their organizations, made a clarion call on the need to conserve and protect our marine ecosystems, saying they are an important fish habitat and a source of protein-rich foods, which is key in boosting food security and nutrition.

Research is also being done to establish whether some marine organisms have medicinal benefits.

Therefore, there is a need to call for action to intentionally take care of the ocean so that it can take care of us today and generations to come. On 25th

June, 2022, KMFRI team participated in another beach cleanup exercise conducted at Tudor creek. The event was aimed at creating awareness on the harmful effects of marine pollution. Representatives from The Kenya Red Cross Society, the Kenya Maritime Authority (KMA), International Transport Workers Federation (ITWF), Mission to the seafarers, KPA sea Scouts, The kingdom Heritage primary school and Early bird Banda amongst others, attended.

About 900kg of trash was collected. Speaking at the function, KMFRI representative Ms Veronica Wanjeri said marine pollution interferes with marine ecosystem and hampers fish breeding. KMFRI received certificates for actively participating in the two events.



KMFRI research scientist Ms Veronica Wanjeri leading KMFRI team.



KMFRI awarded certificates of active participation.



BY MORINE MUKAMI, PHIONALORNA NZIKWA & HINZANO SHEBAN

@KmfriResearch #BlueEmpowermentProject

KMFRI among agencies implementing a livelihood Blue Economy project to empower and improve resilience of fisherwomen in Kenya's coast

Kenya Marine and Fisheries Research Institute (KMFRI), together with five other institutions are implementing the "Opportunities for Blue Economic Empowerment and COVID-19 Resilience of Fisher Women in Kenya" (Blue Empowerment) project aimed at improving the livelihoods of women in Coastal counties through Integrated Multi-Trophic Aquaculture (IMTA). This is following a grant award by the International Development Research Centre (IDRC).

The overall objective of the project is to test and adopt climate-smart integrated multi-trophic aquaculture (IMTA) of seaweeds and fish as means to improve the livelihoods and resilience of fisherwomen in Kenya's coastal region.

The project is led by Africa Centre for Technology Studies (ACTS). Besides KMFRI, the other partners are Kenya Industrial Research and Development Institute (KIRDI), Bahari CBO Network, Kenyatta University (KU), C-Weeds Corporation Ltd, and the people of Kwale and Kilifi Counties of Kenya.



Group photo of partners involved in the Blue Empowerment project

COVID-19 effects

The onset of the Covid-19 pandemic has continued to push communities further into vulnerability moreso, women who were fully reliant on fish and seaweed farming.

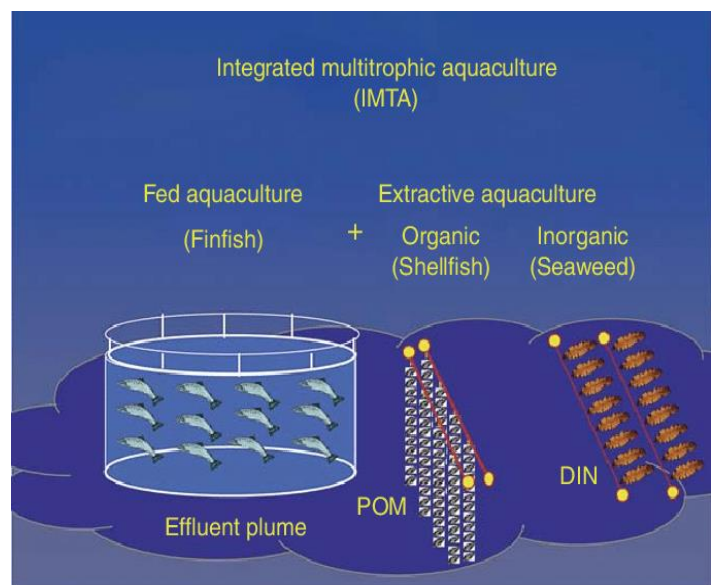
Societal structures and cultural barriers have made it even harder for women to access the required skills, finances, and know-how to thrive among the fisher communities.

To cushion, the Blue Empowerment project is targeting to build the resilience of women by introducing interventions in which communities can leverage on economic activities in the Blue Economy space to enable them to become, empowered, self-reliant, and independent.

The Integrated Multi-Trophic Aquaculture (IMTA) technique that will be applied is similar to polyculture. In IMTA, cultured organisms are integrated such that by-products, including waste, from one aquatic species, serve as inputs (fertilizers, food) for another.



In this concept, farmers combine fed aquaculture organisms such as fish, and shrimp with inorganic extractives such as seaweed, and organic extractives such as shellfish to create balanced systems for environmental remediation, economic stability, and social acceptability.



Conceptual diagram of an Integrated Multitrophic Aquaculture (IMTA) operation by ResearchGate

Techniques to promote knowledge translation, dissemination, and learning for communities

The two-and-a-half-year project is being implemented on the Coast of Kenya with case studies in Kwale and Kilifi counties, where communities are involved.

Additionally, technological institutions, women groups, the private sector, policymakers, and other stakeholders in the Blue Economy will be brought on board to study, co-design, deploy model IMTA farms and use them as platforms to gain practical insights, evidence, and generate data for adoption towards sustainable development in the Coastal region.

This will promote knowledge translation, dissemination, and learning for the local communities, and Coastal communities at large.

Project implementation approach

To attain its objectives, a five-design approach is being used - planning, discovery, defining, developing, and lastly delivering.

The planning phase is being executed by ACTS and is focussing on the management and overall coordination of the activities, monitoring and evaluation of the interventions, and reporting on learnings.

The Discovery phase being coordinated by Kenyatta University and Bahari CBO is responsible for profiling and documenting gender-responsive challenges, potentials, and opportunities.

KMFRI and ACTS are implementing the defining phase entailing mapping social-technical gaps critical for the adoption and upscaling of IMTA.

The developing phase, which is also the fourth, is coordinated by KIRDI, KMFRI, and C-weed, and it entails optimizing value chain scenarios for gender transformative IMTA.

The last phase which is delivery will be done by all partner organizations, focusing on promoting knowledge translation, dissemination, and learning.



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PICTORIAL PAGE by Jane Kiguta & Nancy Mwiti



KMFRI team with prison officials at Shimo la Tewa-Borston during a tree-planting event. The seedlings were donated by KMFRI | Photo by Mwaka Mkalla



KMFRI AD Oceanography and Hydrography Dr Joseph Kamau explains how seawater greenhouse works. The Blue Economy pilot project at Kadzuhoni in Kilifi County will enable farmers in the semi-arid region to practise farming. The system extracts seawater from a borehole connected to the greenhouse, converts the water into vapour, and utilizes the cooling and humidifying power of vapour produced from evaporating salt water. The condensed water is then collected in a water tank and used for farming. In this project, Dr Kamau was assisted by KMFRI Engineers Dickson Aloyo and Joselyn Kendi | Photos by Jane Kiguta



KMFRI CEO Prof. James Njiru moderating the event on Business Partnership for sustainable Blue Economy at Stockholm +50 in Sweden | Photo Courtesy



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KMFRI Kegati Station Director Dr Paul Orina (R) issues a certificate to a farmer after training fish farmers in Western region under Kenya Climate Smart Agriculture project (KCSAP) |Photo by Rachel Ogari



Deputy Director of fisheries Turkana County David Namwaya and KMFRI Research Scientist Mr. James Last sensitize fisher communities from Kerio, Eliye, Kanamkemer, Township, Lake zone, and Kakuma wards on the new fisheries policies and regulations. |Photos by Vitalis Omire



KMFRI senior research scientists Mr. Steve Mwangi and Dr. Joseph Kamau with the project consultant Ms. Sarah and site managers during a site tour of the wastewater treatment system in Shimo La Tewa Prison. The plant will facilitate the recycling of wastewater from prison and neighbouring social joints, houses, and private villas, whose sewage is discharged to Mtwapa creek every day, posing a health hazard to people and sea creatures. The recycled wastewater will, among other uses, be used for farming |Photos by Jane Kigita



KMFRI's Dr Uku (M) with microplastic research scientist Mr Mitto with ADSC Mr Gikambi after hosting French Development Agency reps Drs D Dumet and E. Strady to discuss collaboration opportunities |Photo by Milton Apollo