Field Report
World Bank Kenya NYU Capstone

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Introduction

The goal of this project is to produce a report culminating in a recommendation for the implementation of mangrove restoration and protection, a nature-based solution, in Mombasa. The field work follows a literature review analyzing case studies in mangrove restoration implementation efforts and the applicable institutional and financial frameworks in Kenya, specifically Mombasa. The primary purpose of this field report is to document and further analyze the insights and strategies learned from the Capstone team's field research and meetings with institutions in Nairobi and Mombasa, Kenya. The goal is to begin framing recommendations to enhance the utilization of nature-based solutions (NBS) for the restoration of coastal and shoreline areas, with a particular emphasis on mangroves. The final report will outline recommendations for the World Bank in regards to enhancing NBS initiatives. Stakeholders ranged from large intergovernmental organizations to local resident groups. All meeting notes included here are summarized by main points of discussion, Q & A sessions, and points for further research in order to produce final recommendations for the World Bank's KUSP program.

All stakeholder meetings were attended by Judy Waturi : Disaster Risk Management & Climate Change Specialist, World Bank and Members of the NYU Student Capstone.

ACRONYMS

CBO: Community Based Organization
ICCA: Institute for Climate Change and Adaptation
NBS: Nature-Based Solution
NEMA: National Environment Management Authority
KFS: Kenya Forest Service
KMFRI: Kenya Marine Fisheries Research Institute
KWS: Kenya Wildlife Service
UN-Habitat: United Nations Humans Settlement Programme
SDG: Sustainable Development Goals

University of Nairobi
Institute for Climate Change & Adaptation

09 January 2024
Nairobi, Kenya - ICCA

Transdisciplinary Research

The approach of transdisciplinary research accounts for cultural context, community outreach immersion, and understanding the way different cultures develop solutions to the problems they face. Kenyan culture focuses highly on nature-based solutions, which are ingrained in everyday problem solving and development. The idea is to implement development with the environment, not work against it through industrialized development or gray solutions.

Capacity Building

It is important to take capacity into account, identifying inclusive needs and making the needs and capacity matched. There are four key areas of capacity when considering environmental and ecosystem projects.

National Level: The key issue of capacity building is to leverage cost and benefits among the variety of projects underway in Kenya. In a diverse range of fields for development, there is always a need for privatization. The key is making it reasonable, effective and profitable. An NBS project such as ecosystem restoration and improvement must balance different interests, especially benefits for local people.

County Level: There is never a single county that an NBS affects. For example, mangrove restoration impacts more than five key coastal counties. With respect to the decentralized political structure and relatively independent community power, it is critical to consider cooperation and collaboration between neighboring counties and how to effectively work with each other. Inclusion and people's participatory or even spontaneous actions matter.

Capacity Areas: At all capacity levels the following areas must be considered: technology, financing, information, and inclusive historical background.

Land Use: There is capacity building needed at the community level. The structure of the NBS project must be understood, a local initiative or connected to other forms of government. Land use capacity, ownership, and classification heavily impacts projects. The demographics of the population impacted by the project must be considered. Factors such as gender, youth, and native populations, should be included when conducting ethnographic research.

ICCA NBS Projects

African Future Savannas: The project objective is to identify what the role of an NBS is in protecting the future of savannas, focusing on current gaps and barriers in the regions. The project team sought to analyze how NBS projects can achieve the future visions for communities. The African Future Savannas is working on matching the NBS outcomes with the communities future needs. The project assumes that climate change is getting worse. Rather than see this as negative, the project works to find advantages of climate change and generate preventative measures to safeguard the

savannas.

University of Nairobi & Global Center of Adaptation Collaboration: The focus is three types of resiliency: built, natural, and enabling environment. This project targets building up natural resiliency within proper local policy channels. The key to shielding ecosystems is to protect people's livelihoods in affected areas. A critical step is the review of preexisting policy, understanding who it benefits. The goal is to move towards locally managed systems that are people driven. These systems cannot consist of extreme protection of the environment without consideration of how these protections will harm local livelihoods. Initiatives cannot be inclusive without community involvement, members must be the owners and beneficiaries of solutions. This involves both top-down and bottom-up approaches to development.

Locally Led Investment

To understand the community desire for NBS projects in the region, benefit sharing, who benefits and at what scale, must be considered. In locally-led projects financing may need to operate differently, specifically having fewer restrictions or different parameters so communities can generate unique solutions. Financial inefficiencies are more likely to be generated when projects begin with a bottom-up approach. Projects must ensure that local actors have the necessary resources without bureaucratic delays. NBS can mitigate climate risks though financial consequences still occur. NBS projects are typically mitigation centric with long term benefits, often overshadow by the immediate financial needs related to loss and damage. It is important to create a balanced funding mechanism that does not prioritize mitigation efforts at the expense of addressing loss and damage but integrates, providing a holistic approach to climate resilience financing.

NBS Roadblocks

Factors that can make inhibit NBS in Kenya:

1. Non-participatory NBS projects: If the project has little to no local ownership there is a potential to misunderstand the problem as it is experienced by the local community.
2. Lack of capacity building happening during project development.
3. Ignoring the local community on project issues or concerns about project outcomes.
4. Implementing increasingly limiting or restrictive policy that inhibits the community.
5. Any project that displaces or takes people out of their local communities.
6. Conflicting policies at the state and county level.

People-Based NBS

The NBS in Kenya should place humanity at the core, ensuring that these initiatives are designed and executed around the needs and visions of the community. The success of NBS relies on community members' active participation and ownership. These solutions are not just about utilizing natural resources to address environmental challenges. They are about empowering and motivating the local community, enabling them to be the drivers and beneficiaries of these solutions. The key is NBS does not disrupt the lifestyle of the local inhabitants, but integrates and enhances their daily lives. In order to retain efficiencies generated by expert institutions, a balance between top-down and bottom-up approaches in critical. When initiatives are community led, there are potential inequities that may need to be addressed due to the cultural context. There is also the question of who is local, who is and isn't included in the definition of local. It is important to understand where and how boundaries are drawn and how these intersect with the community perspective. These boundaries can exacerbate inequities.

Notable Projects to Investigate

Mikoko Pamoja: Mikoko Pamoja, "Mangroves Together," is an innovative project in Kenya. It is the world's first community-based mangrove carbon credit scheme, aimed at reducing carbon emissions through the conservation and restoration of mangroves. Located in the Gazi Bay area of Kenya, the project links the environmental benefits of mangrove protection with direct economic gains for the community. By selling carbon credits, Mikoko Pamoja generates funds for local communities, supporting improvements in education, water resources, and other infrastructure. This approach not only aids in preserving the mangrove ecosystems but also enhances the quality of life for communities.

Kwale County: They have led in recent years for best practices in conducting equitable NBS projects.

Lamu County: Projects here combine conservation with the inclusion of women in NBS.

Forest Management Act Kenya: Forests were managed and protected by the government. When this was passed to the local communities, forests began to thrive under local management. Most interesting is how this local ownership approach can inform a similar strategy for mangrove ecosystems.

Participants: Henry G Odhiambo : Research Assistant at University of Nairobi Global Center on Adaptation: Enhancing and Scaling up Adaptation for Resilient Infrastructure in Kenya Rahma Hassan & Alphonse Mollo: Ph.D. Candidates at the University of Nairobi Development Studies Department

UN-Habitat

11 January 2024
Nairobi, Kenya - UN-Habitat Headquarters

GoBlue Initiative in Kenya

GoBlue is an EU funded program connecting the environment, specifically the coastal communities through land and sea planning and management for a sustainable and resilient Kenyan coastline. The focus areas are growth, environment, and resiliency. Six coastal counties run pilot programs aiming to better integrate land and sea planning. These programs aim to make the county spatial plan in line with municipality plan. Most projects are to be completed within the 2024 fiscal year. Examples of NBS GoBlue Pilot projects include Solid Waste Audit Taita Taveta, Kalifi Public Park, Lamu Waterfront Public Space, and Mombasa Conducted Wetland.

These GoBlue pilot programs showcase what can be done at the local county level, since most projects are available at the national level. There is a need to integrate into local communities. The Kenyan national government is usually in charge of ecosystem development plans, whereas the county governments are in charge of waste management. Mombasa is highlighted as a county with serious resilience capacity issues, specifically with waste water management. Based on lessons learned from a successful waste water project in Shimo La Tewa prison, Mombasa county may be able to replicate similar projects. In terms of Mangrove protections, the capacity right now exceeds current government capabilities. There are a lot of players involved in mangroves specifically, but in general there is a need for an increase in capacity.

Related Projects Underway

Non-Coastal NBS projects are mainly attributed to the regional office of Africa, connecting these projects through working UN-habitat documents on housing, resilience, disaster, and infrastructure capacity building. These are predominantly Nairobi River projects and protection initiatives with three main rivers and ecosystems to manage, Nairobi, Ngong, and Mathare. The main issues within these river sheds are solid waste management and illegal waste dumping/ pollution. Projects in these river sheds currently focus on community based projects to help the general public become more aware of the financial capacity building the river holds.

Khalifi county has focused on creating a new municipality spatial plan first draft by March 2024. This plan intends to unite Khalifi county and Nakuru county in terms of SDG development. This plan must first go through the cycle of city governance approval in order to support the review of the sustainable development goal facilitation. Nakuru county, if supported, could become a strong energy and waste management reference point for the rest of Kenya.

Regional Housing Projects include EU and UN-Habitat collaboration for housing production in the region. Housing happens in incremental phases in Nairobi. Upgrading and enhancing these phases using different financial investment models to increase funding from investors is underway. Regional housing projects are a main policy objective movement in Kenya, currently focused on a pilot housing project in Nairobi.

Local Engagement

The Nairobi River Basin ecosystem encompasses lots of informal settlements. These are ecologically fragile communities along the river corridors with problems such as flooding, clean water accessibility, irrigation issues, little access to proper waste management, poor road infrastructure, and erosion. Within these areas, the community is largely responsible for cleanup initiatives, they are major players in efforts made to clean up their own neighborhoods. It is part of UN-Habitat's efforts to increase local knowledge that when the more major players, UN-Habitat and County Government Officials, are involved in cleanup efforts and projects, they will see an increase in livelihood and financial capacity. The public has seen when the rivers are clean the agriculture in the region is more successful. This can create increased economic competition amongst the communities.

Laws define how much and when stakeholder

engagement can occur during the planning process. Informal settlement disputes can happen in areas where UN-Habitat projects are based, but fortunately enough this has not happened to date. It is noted that the projects UN-Habitat are conducting are smaller level micro projects. These tend to be less invasive to a community and have fewer spatial or land disputes in general. UN-Habitat acknowledges that successful projects cannot rely solely on big players or governments. The local people see these projects as government intervention. There is a need for community participation. For reference, UN Habitat has policies on stakeholder engagement; leaving no one behind; women, youth, and ASAL lands. The question now is for community participation capacity building, to what degree UN-Habitat lets communities self-govern these projects. UN-Habitat agrees there is a need for engagement but total self-governance proves risk intensive. Every stakeholder in the area may have different visions of what they want to see out of a project, inhibiting project success.

Land & Sea Planning Initiatives

UN-Habitat is revisiting the idea of spatial planning unification efforts, specifically within coastal counties. Challenges and Gaps include:

- Current spatial planning does not have many intersections between land and sea initiatives.
- Sea level rise is not currently accounted for.
- Little economic data is represented; regions are not currently integrated with spatial planning. Some counties still do not have proper spatial planning documents.
- There is low visibility on economic livelihoods in coastal counties with land and river ecosystems.
- Current spatial planning is very land-heavy and GIS mapping is predominantly in these areas.
- Lamu island is not connected to land use planning. UN-Habitat is currently supporting the review of Lamu County's spatial plan.
- Fisheries are directly part of economic livelihood but are not accounted for, and little data is collected.
- Ecosystems are not properly mapped at the national level to help drive where tourism and protections should be best enforced.
- There is a need for connectivity between land and sea through data, but the question is how to gather and analyze this data properly.
- Current administrative boundaries limit cross-collaboration between counties on spatial planning initiatives. Governance complexity makes it difficult to understand who is primarily in charge of protectionism, enforcement of the sea, mangroves, wildlife, etc.

Participants: The United Nations Human Settlements Programme team. Florian Lux: GoBlue Project Manager. Charles Wagura from the Regional Office for Africa

National Environment Management Authority

15 January 2024
Virtual

Role at National and County Level

NEMA is a national regulatory agency whose mandate focuses on sustainable management of the environment in the country. NEMA supervises and coordinates other agencies on all matters related to the environment. Projects considered high-impact stay fall under the NEMA jurisdiction, decisions are made at the national level. In Mombasa County makes decisions on low impact projects. NEMA operates in all 47 counties with local operational offices. County offices are in charge of low and medium impact projects and activities including waste management, water and air quality, or regulations that address specific areas.

Current NEMA NBS Programs

Green New Growth and Employment Program: This program was designed to integrate environmental sustainability in Kenya's economic growth. It involves working with businesses to adopt eco-friendly practices and create jobs in the green sector. The primary difficulty is persuading traditional industries to adopt new, environmentally friendly technologies and practices. This often requires significant initial investment and a change in long-standing operational procedures.

National Natural Resource Management Program: Focused on sustainable management of natural resources, this program includes community tree planting and sustainable agriculture. One major challenge is ensuring consistent and effective community engagement across diverse regions, each with specific environmental concerns and socio-economic conditions.

Urban Environmental Planning: In response to rapid urbanization, NEMA worked on integrating sustainable practices into urban planning. This includes initiatives for green spaces and sustainable waste management in urban development. Balancing rapid urban development with environmental sustainability is difficult, especially in fast-growing cities.

Challenges for NBS Programs

There is a shift of land use from heterogeneous towards homogeneous patterns. Homogeneous patterns of development tend to hurt the environment more. Economic and cultural drivers have increased rural to urban migration. This has generated changes in land use to accommodate larger slums and informal settlements. This increase in urbanization strains natural resources.

The 2010 Constitution of Kenya created tier levels of government. This has given more power to the community in managing their own NBS initiatives, including public engagement session on natural resources. The National Land Use Guidelines outline the protection of natural resources. NBS projects are classified as low impact by NEMA, therefore jurisdiction is at the county level.

2019-2024 NEMA Strategic Plan

A clear strategic vision to coordinate, supervise and manage all natural resources is critical. One initiative relative to mangroves in the plan is the Environmental and Social Impact Assessment, promoting conservation and management of aquatic and terrestrial ecosystems and the monitoring of green initiatives. Other initiatives include the Ewaso Narok Swamp Management Plan and county air quality monitoring.

Institutional Capacity Building: NEMA aims to improve service delivery through licensing center and decentralization. Challenges to implementation include inadequate funding, NEMA depends on GOK and external development partners, and inadequate infrastructure and office space, NEMA cannot currently expand. There is also an overlap in mandates with other lead agencies and legal constraints.

Monitoring and Evaluation: NEMA completes annual and quarterly work plans generated from the strategic plans. These work plans enable the NEMA staff to know their respective roles and where they can fill the gaps. NEMA has done a mid term September review of the previous spatial plan. The new NEMA Draft Plan will focus on these agenda items: Climate Change, Ecological Integrity of Ecosystems, Pollution, Green and Circular Economy, and Institutional Capacity Building.

Wetlands Specialist

15 January 2024
Virtual

Current Wetland Policy in Kenya

Kenya has strong strategies and local organizations related to NBS and adjacent activities, but the issues are in proper implementation of said strategies. Current Mombasa spatial plan has no GIS references or open data that is useful for mangrove or ecosystem protection and restoration. Currently a national landscape strategy is being developed targeting seven ecosystems, one being wetlands. The biggest obstacle in implementing these efforts are that the institutional arrangements lack actionable items and roadmaps, need prioritization given limited resources, and lack a solid economic foundation and long term financing effort. The devolution of authority puts the county in the lead for implementation given the lack of available resources.

Macfarlane's role is to integrate wetland restoration at the World Bank. This involves incorporating numerous local stakeholders, acknowledging several guidelines on wetlands and biodiversity protection, and target expansion efforts of global funding efforts. Thee significant challenges are understanding the gap in large historical wetland open data and mapping across the different counties, as well as gaps in capacity and funding for these initiatives.

Data Gathering and Assessment

An Africa-wide assessment on mangroves has been completed, but is the only major document highlighting ecosystem surveying data. Currently, there is no online database of wetland, mangrove, or ecosystem open data information for Kenya besides limited ESRI data. Integration is necessary when capturing and reporting data as ecosystems do not stand alone, one affects another (the mangroves affect the marine ecosystems, etc.) UN-Habitat echoed the need for expanded data in regards to development of CIDPs. These CIDPs play a pivotal role in NBS implementation capabilities. Data needs a reference point, the historical information to understand level of loss. KMFRI reference and surveying data only dates back to 1992.

Opportunities for Future Data Integration

Previous project example to look for in terms of data collection/analysis: Port project in South Africa completed by Macfarlane. Targeted data gathering regarding flood risk and storm surge is needed, these are the most threatening natural events for mangrove forests. A useful tool for analysis would be an in depth SWOT analysis of all current coastal ecosystems in Mombasa considering these are areas of concern. There needs to be a link between GIS open data collection and surveying with an increase in livelihood and job creation. Community involvement can even come in at the surveying and mapping level. These are opportunities for building up livelihoods in critical neighborhoods.

Participants: Douglas MacFarlane, Wetlands Specialist

Mombasa County Government
Natural Resources and Water Sanitation

16 January 2024
Mombasa, Kenya - Mombasa County Government Offices

Mangrove Depletion in Mombasa County

Mombasa is a county that has experienced a significant reduction in mangroves due to illegal logging, sediment deposition and encroaching developments. Some coastal erosion and biodiversity loss are caused by this destruction. Mombasa is the smallest county and has the least forest coverage. With about five species of mangroves, Mombasa has limited space to grow and utilize mangroves. By comparison, there are all nine species in Lamu County.

The population growth of Mombasa is creating a high demand for land, therefore informal settlements and new residential developments are encroaching on mangroves ecosystems. The issue of increased demand for housing puts additional strain on the mangroves due to the need to clear areas out for additional housing, especially in informal settlement areas. Poverty stricken areas are heavily encroaching on mangroves and flood prone areas. Heavy pollution is an issue for mangroves, serious plastic pollution is harmful to the environment of mangroves. Waste collection is also sparse in Mangrove dominated areas. 100 tons of waste a day is produced in Mombasa, but the system only has the capacity for 60 percent.

Mangroves have three aspects of value: ecological, social, and environmental. Communities have cut mangroves in order to gather wood for housing and firewood. These are often last resort type measures but are deemed harmful for mangrove protection initiatives. One critical gap of understanding is the knowledge gap for mangrove conservation awareness, especially in critical communities and informal settlement areas. Knowledge of what is included in the “mangrove ecosystem” , therefore harmful to disturb, is fragmented amongst the population.

Energy, Water and Infrastructure Capacity

Much of the mangrove wood harvested is for energy. An exploration of solar cooking as an alternative is underway within the county government. Mombasa experiences heavy flooding and landslides. Informal settlements especially need a build up of infrastructure capacity and resilience of houses in flood areas. Mombasa has three main creeks that surround the entire county by water mass. This in turn makes Mombasa highly vulnerable in terms of water related issues; clean water access, sanitation, flood control, and erosion. Mombasa residents are highly impacted by flooding. Roads are often impassable in low elevation areas during storms. Mombasa is 80% wetlands in these areas.

An underway port master plan in Mombasa does not account for NBS. This plan will destroy 80% of mangroves in the region within ten years. This is a national plan. The county needs to give proper

recommendations on how to avoid the destruction of existing ecosystems. Mombasa has a high water table and low elevation, threatening the sewage system infrastructure and increasing likelihood of water contamination in flood events. Mombasa has no internal water source. The county is currently reliant on other regions of Kenya to provide reliable drinking water.

NBS Challenges and Capacity Building

Echoing the key conflict for mangrove conservation, the knowledge gap for NBS is still a critical issue for local engagement. People lack the information or may not yet see the utility maximization of NBS or how to engage properly with an NBS. Many individuals and organizations participate in these efforts but the NBS terminology is not widely used.

Local communities by law are a part of planning initiatives. NBS initiatives should work to identify those with technical skills to co-manage spatial planning NBS projects. Land tenure systems affect NBS initiatives, mangrove restoration and urbanization. NBS initiatives must begin to be considered and utilized in spatial planning. There is no current consistent method for how to implement/manage a NBS. For an NBS initiative, the county is highlighting three gaps: financial, technical, and educational. Mombasa is expecting and looking for scientists and funding support for NBS projects.

This challenge is seen in the newly completed bridge that experiences consistent flooding and the port expansion plan. NEMA needs to incorporate NBS practices into their approvals of infrastructure. The current spatial plan is in the final approval process. Climate change initiatives are explicitly spelled out. NBS projects are included but the NBS terminology is not used in the plan. Mombasa county needs a way to prioritize NBS. Gazi Bay and Malindi offer examples of effective mangrove initiatives in Kenya for further research.

Participants: Johnson Mwikya : Climate Change Officer, Abdulsalam Omar: Water Sanitation Officer

Bidii Creek Conservancy
Conservation CBO

16 January 2024
Jomvu Constituency, Mombasa County, Kenya -
Organization Headquarters & Mangrove Site

Organization Overview

The Bidii Creek Conservancy was founded in 2013 with the primary purpose of mangrove restoration in the Jomvu Kuu sub-county. To date, 3 million trees have been restored, approximately 70% of the creek area. Some natural regeneration happens when dealing with mangroves. This supplements the initial human interventions made by Bidii Creek. Bidii translates from Swahili to “much effort”, hard work.

Bidii Creek is a restoration organization with youth and female centered initiatives. Women are targeted to join pottery creation and bee-keeping initiatives in the mangroves. Initial efforts to expand into pottery have begun. There is a dedicated firing area and studio with 10-15 women participating in the production of pottery. They are targeting a scale-up of production while retaining historical practices and methods. Youth programs target employment opportunities. The biggest challenge with youth volunteers is their desire to see immediate results and mangroves take seven years to mature. The work takes patience and requires consistent monitoring.

Challenges & Opportunities

The mangroves in this area are very difficult to access, the steep elevation between the land and the forest limits restoration participation. The mud can become too difficult to maneuver through and prevents a scale up of current restoration efforts. Additional problems arise when natural flooding and high tide occurs. Many people’s homes are too close to the river and cause erosion of agricultural sediment that harms the planting process of mangrove species. Landslides during heavy floods have also created similar issues. Current funding is predominantly philanthropic and therefore can be inconsistent and difficult to rely on. The lack of proper funding creates gaps in equipment. An upgrade of tools for replanting, honey, and pottery is needed. Bidii Creek wants to expand their volunteer efforts and increase collaboration with other local CBOs and NGOs to scale up mangrove restoration and education.

Organization Site: *Bidii Creek Conservancy-CBO, Facebook Page*
Participants: Ali Machicha, Bidii Creek Chairperson

Pwani Youth Network
Youth Service CBO

16 January 2024
Mikindani, Jomvu Constituency, Mombasa County, Kenya - Organization Headquarters Bangladesh, Jomvu Constituency, Mombasa County, Kenya - Plastic Recycling Center

Overview of Initiatives

The organization began 7 years ago to operate as a youth-run network, currently 18 CBOs. Pwani wants to allow the community to lead their own cleanup and promotional NBS initiatives with a focus on women's empowerment and youth advocacy for climate change. Current Programs Include: Health, Job Livelihood (digital training, restoration & plastic recycling), Sports & Talent, Climate Change (mangrove, beach clean-ups, and advocacy - chainmakers). The organization initiatives include advocacy for government action. Current financial support comes from county government, national government, some corporate donors (logistics company) but mostly from PACJA & VSO. Climate Change education initiatives include podcasts, youtube channel, events and peer advisors collaborating with schools. Generally community support is strong with increasing interest as first hand effects of climate change become more apparent.

Challenges & Opportunities

Collaboration with the county government is fairly strong with the group collaborating on the CIDP. There is an opportunity to increase engagement with county and national youth departments. The challenges faced by the youth include low employment, drug abuse, teen pregnancy, and recruitment from insurgent groups. Currently, more attention needs to be on E-waste and how to properly clean up/discard this waste in Mombasa. Pwani and other groups need to find ways to build capacity to properly store these materials.

Plastic Recycling Program

This program employs youth to collect plastics and recycle using plastic shredding and molding machines. One machine was inoperable at the time of visit, requiring maintenance. There is a clear opportunity to expand the recycling capabilities of the group. This could include the development of more waste management collection centers, plastic recycling capabilities, and waste collection services.

Organization Site: *https://pwaniyouthnetwork.org*
Participants: Alfred Sigo, founder and CEO of Pwani Youth Network

Kenya Marine and Fisheries Research Institute

17 January 2024

Mombasa, Kenya - KMFRI Corporate Office

Mangrove Related Initiatives

The majority of nature-based solution initiatives at KMFRI are mangrove related projects. A four-person team works on these projects and related research KMFRI is a national research institution, therefore the work does not stay within the boundaries of Mombasa County. KMFRI does not manage mangroves and works with KWS & KFS, each operates under mangrove-related mandates. Marine Ecosystem Department researches sensitive ecosystems of mangroves, seagrasses, and salt marshes.

The largest mangrove related project was a collaboration with NEMA to produce the National Mangrove Ecosystem Management Plan, which provided robust data on mangrove loss and species evolution since 1992. Data was collected over five years, including surveys and field visits. The prior data initiative was a study on the effects of the 1998 El Nino. KIMFRI acknowledged the need for social & livelihood data to complete the picture. An erosion effects report is currently underway.

Mangrove degradation in Mombasa is higher than the global deforestation rate. Indonesia leads in global mangrove cover. Kenya has approximately 745k hectares of mangroves, current estimates are 30k lost with 40k restoration potential. The mangroves have an economic value of 33-50k USD per hectare per year. The Mikoko Project was the world's first blue carbon project with 3k tonnes of carbon sold, generating 18k USD per year. The funds get utilized in community projects including the Ecotourism and Forest Scholars Project. The Vanga Blue Forest project began in 2019 with 460 hectares of mangroves. It has prevented 15k tonnes of carbon emission. Community projects have included library, power resources, and education. The project was featured at World Ocean Summit.

Carbon Credits

The value of mangroves goods and services in Kenya is valued at 85.8 mil USD per year. A new blue carbon project must meet the following conditions:

- Additionality - The project must prove reduction in carbon greater than the counterfactual.
- Minimize Leakage - The risk of an increase in emissions by another entity due to the carbon credits must be assessed.
- Permanence - It must be a permanent project.

KMFRI Carbon Credit Process:

1. Participant must register to trade in the carbon sequestration project. This includes individuals or user groups and participatory forest management agreement must be signed prior.

2. Monitor Forest & Collect Data. Training for youths and communities on how to monitor forests is completed prior to data collection Further training is needed to translate that data into biomass and then a sequestration rate. KMFRI leads in this effort.
3. Utilization of Funds - After one year of sales, communities meet to determine how to utilize funds, they do not go to individuals. Projects can include resources in health, education, and water. Funds are distributed based on number of people. A community leader group (voted on by fellow members) runs the meetings, work plan, and restoration schedule. Payment is not received for failed projects, for example if mangrove restoration efforts do not take root and the trees die. The pricing reference is the S&P Global Platts Carbon Credit Assessments. Initial efforts are underway to begin assessing sea grass conservation for carbon credits. Current market rate for mangrove carbon sequestration is 8-10 USD per tonne. Rate increases to 25 USD per tonne for sea grass sequestration. Carbon credits are currently in high demand but benefits are being sought beyond carbon as the world may push to negative carbon and the demand for credits may decrease.

Challenges & Gaps

Wood Harvesting: A building and heating alternative is needed to decrease wood harvesting.

Sedimentation: As erosion and other factors cause soils to change, the mangrove species that thrives will change. Understanding this requires through data collection and surveying.

Land Use Changes: Mangrove areas get converted to residential development, agriculture and salt mining.

Volume: There is a lot of land area to survey and collect data on. The capacity is not within KMFRI to survey regularly, they require more forest scouts. Mangroves are difficult to access.

Erosion: This comes from encroaching development and certain farming practices. Tanu River sedimentation is a prime example.

Oil Spills: Events in 1998 & 2005 have left many areas still recovering.

Community Engagement

There are several areas to scale up employment opportunities, including regular employment to gather baseline data and casual employment for dredging, etc. Forest scouts receive training from KFS and coordinate patrols. Currently, they are employed by project to monitor illegal activities. There is also an opportunity for collaboration with community experts and CBOs to collaborate on data collection and forest monitoring.

Participants: Dr. Amina Hamza, Senior Marine Ecologist and KMFRI Mangrove Specialist
Fredrick Guya, Marine Research Scientist and KMFRI Mangrove Specialist and NYU Members Layla Bellissimo, Emma Clark

Kenya Wildlife Service

Government Agency

17 January 2024

Mombasa, Kenya

Kenya Wildlife Service Mombasa County Office & Mombasa Marine Park

Mandate & Role

"Conserve & Protect" is the mandate of KWS jurisdiction with activities including: conservation of key species (25% of wildlife is in protected area), collaboration with community and partner with agencies and enterprising of wildlife livelihoods to expand on livelihood opportunities and give people ownership of wildlife resources (currently seen as under utilized).

Marine Conservation along Kenya coastline includes: 6 Marine Reserves (1 in Mombasa) - areas where fishing and other activities are permitted but regulated and 4 Marine Parks (1 in Mombasa) - areas with no fishing, etc. permitted. KWS protects12 km of Mombasa beach through:

- Protection of the 3 critical habitats: Mangroves, Sea Grass, Coral Reefs
- Promotion of fisheries resource for livelihoods
- Advance research, education and awareness of marine resources

Mangroves are not monitored by KWS, it is the jurisdiction of KFS. KWS does participate in mangrove clean-up and replants in collaboration with KFS. KWS does monitor water quality, a metric impacting the health of the mangrove ecosystem. KWS is a protective force with powers to arrest and prosecute.

Restoration & Monitoring Efforts

Restoration: The goal is to get the ecosystem/ habitat functional through passive (stopping illegal activity) and active (beach clean-ups) efforts. There have been positive outcomes for seagrass habitats following confiscation of fishing nets. Beach clean-ups are mandatory for some individual and corporate beach users. Some community members are employed and all trained on the beach clean-up program and provided with a checklist of what to collect

Monitoring: Thorough evaluation system is utilized for evaluation of the Mombasa marine park and marine reserve. Certification programs, open to community members, are available for marine professional training at three levels. Monitoring includes the following:

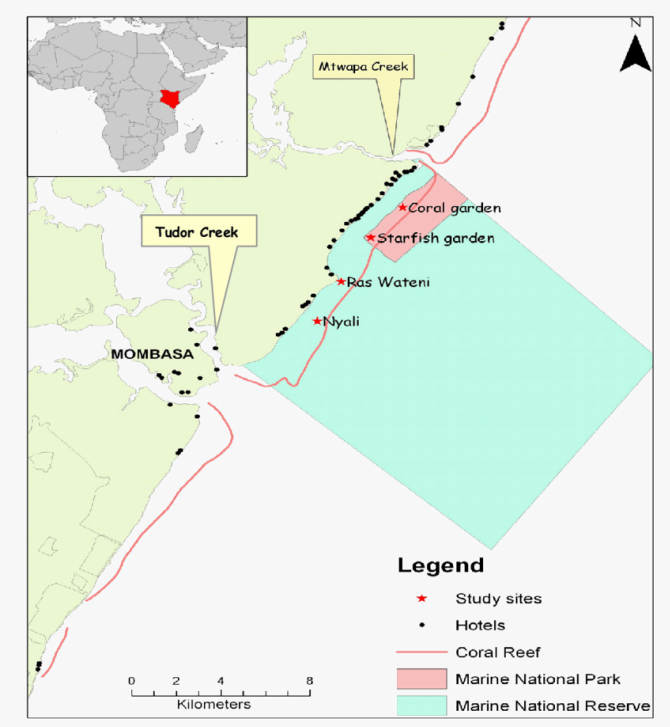
- Water Clarity: If water is too murky the evaluation will not proceed.
- Recreation: number of activities and people participating
- Boating activity: number of boats and moorings
- Fishing: violations in reserve and any illegal fishing in park (clear boundaries)
- Indicator species: specifically number of trigger-fish and sea urchins. Too many sea urchins threaten coral and indicate low trigger-

fish numbers. Community members have been educated on benefit of trigger-fish and it is illegal to catch and keep trigger-fish, compensation is provided for protecting the fish species
- Substrate: damages to sea-floor
- Water Temperature

Capacity & Opportunities

- Monitoring is a very expensive initiative, currently 10-15 people monitoring marked areas on a monthly basis (some daily monitoring). With adequate resources, KWS can train more community members for the monitoring program. This provides employment as well.
- Beach-clean ups lack the necessary manpower. KWS can collaborate with Brain Youth Group and beach-front hotels to increase capacity for clean-ups.
- Waste collection is also an issue following a beach clean-up. Baus Taka can be connected to assist in waste management services.
- KWS has robust monitoring practices and records all data however, this data stays in-house. There could be an opportunity to share this data with KMFRI or other agencies working in these ecosystems. Additionally, KWS can share and train other organizations in monitoring and evaluating best practices.
- The county intends to utilize the collected data for carbon credit calculations, and potentially partner with KMFRI, as they are already well-practiced in this effort.

- Strategic Adaptive Management (SAM) is a monitoring program not yet qualified in nature-based solutions. It is included in the KWS budget and is one of the biggest training resource centers. This potentially could be expanded to include mangrove initiatives and other NBS or inform mangrove and NBS programs.
- Is is critical to understand the opportunities from WIOMSA, the Western Indian Ocean Management Sciences Association.
- The introduction of Kenya Coast Guard provides an opportunity to share or collaborate to secure, protect, and defend the marine resources.
- A more thorough study to quantify the damages caused by the container ship that ran aground in Mombasa will help KWS communicate the severity of potential incidents and better understand the recovery needs.



Map Citation: Cosmas, Nzaka & Munga, Cosmas & Mohamed, Mohamed & Obura, David & Vanreusel, Ann & Dahdouh-Guebas, Farid. (2010). Resource Users' Perceptions on Continued Existence of the Mombasa Marine Park and Reserve, Kenya.

Brain Youth Group
Conservation CBO

18 January 2024
Junda, Kisauni Constituency,
Mombasa County, Kenya

Role and Operations

Brain Youth Group includes youth (18-35 yo) members from the local community bordering the Tudor Creek mangroves. The organization is predominantly made-up of women. While not targeted specifically, the trend is that women are more interested and "patient" towards conservation efforts. The work includes restoration of the mangroves, bee-keeping and honey production, and management of two fishery ponds (one for prawns and one for milk fish). The group also participates in beach clean-ups and wants to expand this initiative, encouraged to reach out to the Kenya Wildlife Service.

Capacity Building Interests & Opportunities

Currently, the honey and fisheries production is consumed by the group members and their families, in lieu of selling to the market. An ability to increase the production quantities of both initiatives will allow the organization to sell the surplus on the market. Mangrove honey is a high value commodity for the region.

Bee-Keeping Education: The organization currently operates 20 bee hives with a production capacity of 10 liters each. However, the current hives are only producing 1-3 liters each. There is an opportunity to partner with Bidii Creek or other organizations to uncover practices that capitalize on the full capacity of the bee hives. The group currently sends one member for bee-keeping training. Sending more members can also open up the capacity of the bee hives. Additionally, learning how to cube the honey can open up selling opportunities to resorts in the county.

Marine Fisheries: The two ponds currently produce food consumed only by the group. The ponds are located in a natural silty "dead" zone between the mangroves and the land. This zone had room for 4-6 more ponds that could hold more prawns and milk fish or other species determined to be viable. The prawns and milk fish are caught from the mangroves and then mature over a 3 month period until they are harvested. More ponds allow for the opportunity to cycle the harvesting times so that production can be consistent.

Collaboration: Brain Youth Group has limited connections with other CBOs in the county. They can connect with Baus Taka to engage with women-led initiatives and waste management resources. They can connect with Bidii Creek for education and best practices on mangrove restoration and honey production. They can also share fisheries information with other groups.

Threats and Challenges

Erosion: The encroaching development of the neighboring informal settlement is one of the biggest threats. There is a new home built directly on the end of the forest at the elevation of the mangroves. This encroaching development creates erosion of silts into the mangrove area that mangroves cannot successfully grow in. There is little, if nothing, that a CBO can do to combat such a threat.

Waste Management: Trash and waste remains a threat, most visible in this region. Waste covers the base of sections of the mangrove forests. The issue is three-fold:

- Waste Management - Mombasa county does not have the necessary capacity to collect all the waste produced in Mombasa. This leaves waste leftover and makes it difficult to receive waste pick-ups following a clean-up project.
- Mangrove Access - The mangroves forests are difficult to access and maneuver through making waste collection difficult within the forest.
- Topography - Mangroves lie at the lowest elevation, therefore overflowing waste and improperly disposed of waste drain to the lowest point and fill the mangrove forests.

Link: https://brainyouthgroup.com

Kenya Forest Service
Government Agency

18 January 2024
Mombasa, Kenya
Kenya Forest Service Mombasa County Office

Mandate & Role in Mombasa

KFS mandates are under the 2016 Forest and Conservation Act (FMCA). Organized as three directorates (Management, Protection, Policing) and seven regions. Mombasa is a coast conservancy, each Kenyan county is run as a conservancy. Conservation is three-fold including: social, ecological, and biodiversity. KFS works as a custodian for natural resources, specifically government forests.

Mangroves are a "multi-managed" area however KFS has jurisdiction over the forests. They are the umbrella other organizations fall under. They must go through KFS for all mangrove forest related activities between highest and lowest watermark. KFS collaborates with thirty CBOs and manages agreements for collaboration. KFS also utilizes public-private partnerships, again managing agreements for collaboration. Policies tend to overlap with the Water Resource Authority. The Water Resource Authority mandate extends 30 meters beyond the highest watermark, confusing who takes the lead. KFS does not take a "scientific" role, that is predominantly KMFRI. Instead, KFS receives data and input from KMFRI applicable to KFS role. KFS remains focused on policy and implementation, with notable acts including the Sustainable Fisheries Act and Forest, Conservation and Management Act.

Mombasa County Mangrove Forests

Mombasa has only mangrove forests and peri-urban mangrove forests. There are no terrestrial forests in the county. When including urban forestry, about 12% of Mombasa county has forest coverage. There are ~4.322 hectares of mangroves with two dominant species in Mombasa (~65k hectares in all of Kenya). KFS refers to mangrove forests as the "Rainforest of the Sea" because of their diverse ecological importance. The role of mangroves is viewed under 5 categories:

- *Support* of fish and other species integral for ecosystem life
- *Filtration* of pollutants naturally from water and surrounding land
- *Resources* provided including fish, honey, wood, etc. used for food, resources and livelihoods
- *Regulate* carbon through natural sequestration (7-10x compared to terrestrial forests)
- *Tourism* revenue generated (the crab shack in Northern Kalifi) Mombasa does not currently but could capitalize on mangrove tourism.

There are both human and natural threats to mangroves. Human threats are more impactful and remain the hardest to combat. Encroaching development is one of the dominant issues in Mombasa.

Proposed Capacity Building Initiatives

- Partnership with Kenya Wetland
- Partnership with insurance company to adopt mangroves, revenue generation
- Successful implementation of ecotourism center
- Fish Pond Case - studying cycle with mangroves

Mangrove Enforcement Activities

- KFS operates as protection and security with powers of a discipline force.
- They lack capacity required to address all illegal activities in forest.
- At the regional level, a Forest Rapid Units operates as emergency response.
- Community Engagement includes training scouts, operating out of outposts in the informal settlements that have stationed rangers.
- At coastal level, a mangrove coastal force officer leads biodiversity monitoring and evaluation teams. This is an opportunity to understand the type of evaluation metrics gathered and recorded in order to share with other organizations.

Participants: Kenya Forest Service Mombasa Officers & NYU Members Layla Bellissimo, Emma Clark

Baus Taka Enterprise
Waste Management CBO

18 January 2024
Old Town, Mombasa, Kenya -
Central Waste Collection Site

A Tech-Integrated Solid Waste Enterprise

Baus Taka is a waste management enterprise co-founded by Dr Tayba Hatimy and Abdul-Rahman Mohamed. Both the challenges of waste management in Mombasa and a report of plastic waste soon outnumbering fish in the sea spurred the formation of the enterprise. The goal is to address the low capacity for waste management in Mombasa County. Plastic and sewage drain into the water, affecting food safety among other issues. Waste policy is sufficient in Mombasa but rate of waste generation is high, outpacing capacity. The main Mombasa dump site has been greatly improved from its 2021 status. The enterprise began with a waste management app but with limited access to smartphones, services evolved outside of the app.

Education on Waste & Climate Change

The organization teaches households the importance of sorting waste. Petrol drums have been distributed in areas of Mombasa for waste collection. The drums are painted with messaging and art to communicate the consequences of waste in the seas and waterways. There are several plastic collection sites around Mombasa. The waste is collected in expired shipping containers painted with educational messaging about waste management impact of natural resources. One program targets young women and girls, teaching them about waste segregation.

Waste Management Service for Households

Households, once taught to segregate waste, can either call for pick-up or drop off waste at the nearest collection center. The app allows clients to request a pick-up or find the nearest location. The majority of the app usage is from high-income clients. Low-income clients prefer human interaction and have fewer resources to access the app. There is also an age barrier with app usage, younger people use it more frequently. The Nyali region has a strong clientele as communities begin to grow knowledgeable about waste.

Social Business Model

Baus Taka operates a social business model with cost sharing. All clients are taught to sort their waste in order to be picked-up. Used hemp sacks are distributed to homes for collection of waste. The high-income clients pay to have their waste picked up. The low-income clients are paid upon waste pick up or drop off. Lower income clients tend to prefer the human interaction of the drop-off site. Health services were originally offered to low-income clients but cash was preferred. The market dictates the amount of compensation for low-income clients. First hand accounts show women utilizing this cash for consumption smoothing.

Challenges

- *Enforcement*: Non-licensed youths (often homeless and/or people suffering drug abuse) offer to collect and drop off others' sorted waste and arrive at Baus Taka collection sites with plastics expecting financial compensation for the waste. This disrupts Baus Taka efforts. Current dialogues with the county are underway to address this issue.
- *Data Collection:* Data, household location and waste quantity, is collected from the high income clients. It is difficult to collect data from low income households as they use app resources less. Generally in Mombasa keeping track of waste tonnage is difficult. Data collection in regards to waste amounts is critical to understanding the need for scaling up resources and capacity.
- *Collection & Recycling Capacity*: Space is the primary capacity issue regarding waste collection. Sites are set by NEMA. There is lots of community interest, however coordinating with the high office at the county can be a more difficult task. Currently all plastic collected in Mombasa is taken to a recycling site in Nairobi, the nearest option.

Opportunities

- *Data Collection/Collaboration*: There is a vision to use the Baus Taka waste collection app in partnership with the county to track waste collection trucks. There are instances of waste being collected from high-end private households, not the task of the collection trucks.
- *Expand Waste Management Services*: Plans are underway to acquire two more shipping containers. One will be utilized as an environmental library to increase community knowledge on climate change. One will house a plastic recycling machine. This will allow greater education and participation in waste management. In addition, there is a desire to set-up more material recovery facilities within neighborhoods.
- *Collaboration with CBOs*: Baus Taka could connect with CBOs working in restoration and conservation, namely Brain Youth Group which has a predominantly female composition. This could further Baus Taka's vision to break female stereotypes and cultural barriers preventing women from engaging in this work. Additionally, Brain Youth Group has an issue finding a place to take the waste they collect during mangrove clean-ups. They and other CBOs could connect with the app for waste management services.
- *Plastic Lumber for Mangrove Access Infrastructure*: There may be a long-term opportunity to connect the collection and recycling of plastic waste into plastic lumber to utilize for mangrove boardwalks and stairs. A Lamu organization has created plastic lumber from waste to develop boats. Baus Taka has a vision of starting a plastic recycling facility in Mombasa and many CBOs expressed a desire for mangrove boardwalks and access points. With a large front-end investment, there is an opportunity to connect the two missions and create more employment in Mombasa.

Organization Site: *https://www.baustaka.co.ke*
Participants: Dr. Tayba Hatimy, Rahim Mwatsahu & NYU Members Layla Bellissimo, Emma Clark

Conclusion

This field report for the World Bank Kenya Urban Support Program by NYU Capstone students highlights several areas for capacity building among stakeholders in Kenya. These areas include:

Technology and Information Sharing: Enhancing technological capacities and improving information sharing among stakeholders for better management, coordination, and protection of natural resources.

Financing and Resource Allocation: Developing sustainable financing models for NBS initiatives and ensuring equitable distribution of resources and benefits among communities.

Community Involvement and Collaboration: Strengthening community engagement in environmental conservation efforts by incorporating local knowledge and ensuring that interventions are inclusive, particularly of marginalized groups such as women and youth.

Policy and Governance: Aligning national and county-level policies to support environmental conservation efforts and addressing legal and institutional gaps that hinder effective implementation of NBS projects.

Education and Awareness: Increasing awareness and understanding of the importance of NBS and environmental conservation among the general population and specific target groups.

These areas are critical for enhancing the capacity of all stakeholders involved in environmental conservation and NBS projects in Kenya, ensuring sustainable development and protection of natural resources. The final report will address the capacity areas in four target recommendations for World Bank participation in NBS:

Scaling-Up Community Based Organizations: There are several robust and knowledgeable community organizations working on mangrove restoration and protection initiatives. There is not a need for large investment in new or overhauled community participation. Instead specific targets can address the predominant capacity need of increased financial support, efficiently enhancing NBS work.

Waste Management Collaboration: It was both observed and heard that trash and waste is on of the biggest obstacles to thriving mangrove forests. There are clear opportunities to utilize collaboration between national, county, and community stakeholders to increase waste management capacity in Mombasa. Invested in waste management is investment in cleaner mangroves.

Data and Information: Tracking ecosystem health is a critical component of mangrove restoration. There are several organization working to collect data. This creates an opportunity to share data in order to communicate the successes and shortcomings of NBS projects.

Spatial Growth Planning: Rapid Urbanization is not an issue unique to Mombasa. It is a issue with detrimental impacts to the mangrove ecosystem, especially in regards to erosion and overwhelmed waste systems. Mangrove forests lie at the lowest elevation in Mombasa and increased rains have flooded more pollutants and sediments into the forests. This inhibits mangroves from growth, regardless of restoration efforts.