



Multi-Stakeholder Approach in Natural Resources Management: The Case of Mida Creek and Gongoni-Marereni Mangrove Ecosystems in Kilifi County, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Multi-stakeholder approach has an overall improvement in conservation and management of mangrove forests resources, more so with a functional coordination framework among stakeholders. Mida creek and Gongoni-Marereni sites were compared in terms of the presence of the multi-stakeholders and the level of coordination and cooperation among stakeholders in conservation of mangrove forests. Data was gathered through a semi-structured interview questionnaire from Key Informants from the stakeholders present in the two sites. The data collected captured stakeholder presence on site, participation in mangrove conservation, and coordination and cooperation with others. There was a variation in multi-stakeholder participation in the two sites. Gongoni-Marereni site had less stakeholders compared to Mida creek which had more, with the latter having a greater participation of stakeholders. The Gongoni-Marereni site mangroves were degraded while in Mida creek had healthy mangroves.

Keywords: Multi-stakeholder; approach; resources; mangrove; ecosystem.

1. INTRODUCTION

Globally, the mangrove forests have significant ecological and economic roles. Various benefits such as improved livelihood, timber, poles, Charcoal, fuel wood, habitat, shore line protection, traditional medicine, nursery, and carbon sequestration are derived from mangroves [1]. Extraction of mangroves has continued over the years with relative increase in demand for their products and conversion to other land uses. Loss and degradation of mangroves is caused by overexploitation, land conversion for other uses, climate change and pollution [2].

Current global estimates indicate a 14.8 million hectares of mangrove forests cover. From the years 1990 to 2020, about 1.04 million hectares of mangrove forest cover were lost globally. Africa has had a mangrove forest cover loss of 2330 ha per year between years 2010 and 2020. The largest mangrove forests are in Asia having 5.55 million hectares and Africa with 3.24 million hectares. About 40% of the world mangrove forests are in four countries which are Indonesia, Brazil, Nigeria and Mexico [3].

Mangrove forest ecosystems cover is larger in the northern Kenya coast region with about 67% of the total cover in Lamu – Kiunga and Tana Delta in Lamu and Tana River Counties, while the rest are in Kilifi, Mombasa and Kwale Counties [4]. The total mangrove forest cover in Kenya coast region is about 530 square Kilometres [5]. Kenya has ten of the mangrove species that occur in the East African Coast These are *Avicennia marina* (Forsk.) Vierh, *Lumnitzera racemosa* Willd, *Pemphis acidula* Forst, *Xylocarpus granatum* König, *Xylocarpus moluccensis* (Lamk.) Roem, *Bruguiera gymnorrhiza* (L.) Lam, *Cerriops tagal* (Perr.) C.B. Robinson, *Rhizophora mucronata* Lamk, *Sonneratia alba* J. Smith, and *Heritiera littoralis* Dryand. [6]. Mangrove forests are in Mtwapa creek, Takaungu, Kilifi creek, Mida creek, Sabaki, Ngomeni, Gongoni and Marereni in Kilifi County with an area coverage of 6000 ha along the coast line [7]. Mida creek mangrove forest ecosystems cover an area of 1746 ha with species occurring in this locality [8]; and Warui (2011) recorded a mangrove forest loss of 105 ha [9]. The Gongoni-Marereni (commonly referred to as Ngomeni area) mangrove

ecosystems cover an area of about 4,240 ha, the largest in Kilifi County [10].

Multi-stakeholder approach in natural resources management is vital in decision-making, contributes to quality policy decisions and enhances policy acceptance during implementation [11,12]. The engagement of multi-stakeholders helps in coordination of policies across sectors in conservation and management of mangrove forest ecosystems [13]. Public participation increases confidence and enthusiasm in mangrove forests conservation and provides a focus for construction of common perspectives, agreed on solutions and interactions to reach consensus regarding the set objectives [12]. Local communities have rich indigenous knowledge which enrich and complement scientific knowledge and techniques of mangrove forest resource management at the local level [14,15].

The local communities and private organizations play pivotal role in designing and implementing policies aimed at improving environmental management and pursuing sustainable development [16,17]. Through the National Forest Policy (NFP) and Integrated Coastal Zone Management (ICZM), the Kenya government commits itself to mangrove forest ecosystems management [1]. The government has established various agencies dealing with forests and protected areas and are have mandate to manage coastal and marine resources including mangrove ecosystems. Kenya forest services is the government agency in charge of management of all forests in Kenya and in charge of coordination of other stakeholders in all sectors [1]. For a sustainable environmental conservation, multi-stakeholders which include the government, the private sector, civil society, community groups and ordinary citizens must work in collaboration [18].

This study was seeking to establish if there was effective and efficient multi-stakeholder participatory management of mangrove forests in the Kenya Coast region. It involved comparison of site-specific mangrove forests multi-stakeholder participatory management to establish variations if they existed. This was in order to effectively address social and environmental concerns and achieve effective and efficient mangrove forests conservation and management in the Kenya Coast region.

1.1 Study Area

Mida Creek and Gongoni-Marereni Mangrove forests ecosystems were the two sites in which the study was conducted, located in Kilifi County

in the North Coast of Kenya. The two study sites are separated by distance of about 68Km. Location of the two study sites is shown on the maps below, (Fig. 1).

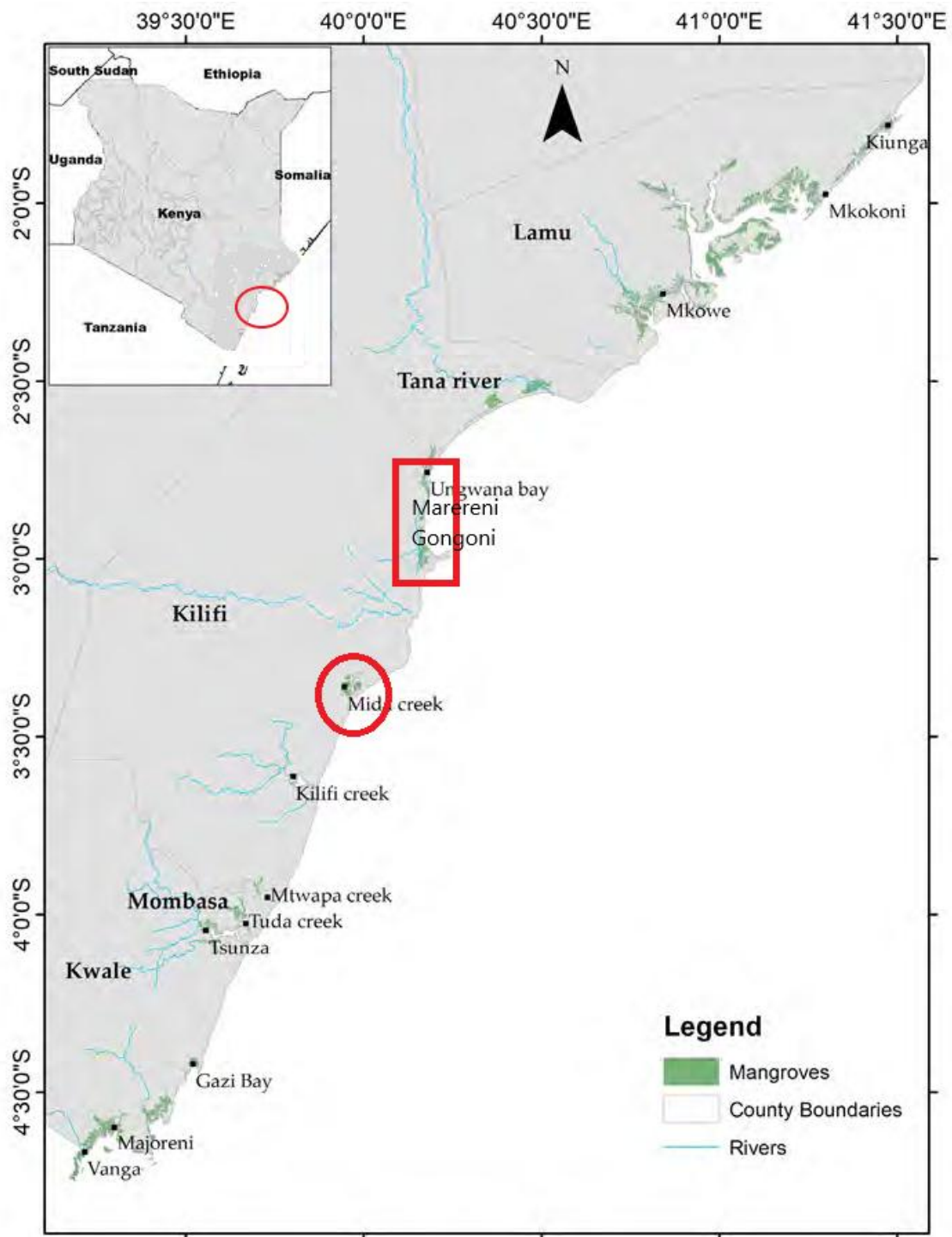


Fig. 1. Location of the study sites (source: [19])

Mida creek is located at latitude 03° 22' S and longitude 039° 58' E in Kenya, East Africa. Creek area coverage is a total of 32 Km² including that covered by mangroves. Mangroves at Mida creek are separated naturally by the main creek into the two local villages or islands, that is Kirepwe and Uyombo [8]. Gongoni-Marereni area has a combination of riverine, creek and fringing mangroves. Majority of the mangroves in the study area are separated by small creeks and are generally overexploited and converted for salt harvesting [20].

The climate of the Kenya coast region is fairly similar, hence fairly uniform weather conditions in Mida Creek and the Gongoni-Marereni areas. The climate is hot and humid with temperatures ranging between 24°C - 35°C and a mean annual rainfall of between 500mm – 900mm annually. Average relative humidity is high throughout the year; however, the rain season has the optimum humidity levels of up to 90%. Two rain seasons are which are the long rains (March to May) occurs during the South East Monsoon and the short rains occur during the North East Monsoon (October to December) [8,10,21].

2. METHODS

A quasi-intervention model was used in this study as it was difficult to assign random participants to different levels of the different stakeholders in mangrove conservation [22]. A comparison of the two sites with different level of stakeholder involvement was carried out to measure stakeholder interventions' impact on mangrove conservation efforts.

An estimate population of 60 multi-stakeholders. The study population was estimated from the multi-stakeholders engaged in mangrove resources conservation. A total population of 60 multi-stakeholders in four categories were operating in the two study sites, drawn from clusters of the government agencies, civil society, private sector and local community. Sample size of 15 Key Informants was derived by applying the formula by Daniel [23] with a 5% confidence level applied.

$$n = \frac{NZ^2 p (1-p)}{d^2 (N-1) + Z^2 p (1-p)}$$

Where: N= total number of multi-stakeholders in Mida Creek and Gongoni-Marereni; Z= 1.96

standard error from the mean; P=0.2 availability; and D=0.05 absolute precision.

In-depth Key Informant Interviews using semi-structured interview questionnaires were carried out with the management level personnel of stakeholders in the local community, private sector, NGOs and the relevant government agencies to gather data on variables under investigation. Experienced members of local community groups were used as key informants. The identification of stakeholders was done at various levels of stakeholder participation.

Data entry, and categorization to produce frequency tables and charts was done in Statistical Package for Social Sciences (SPSS) version 21. Paleontological Statistics Software package for education and data analysis (PAST) version 2.09 was used to cluster interventions by various stakeholders present in the two sites using qualitative stakeholder analysis. Pair-wise ranking comparison procedure was applied to identify utilization and dependency on mangrove in each study site. The results of pair-wise ranking were used to explain the stakeholders' involvement in the mangrove conservation efforts and their interests in supporting the objectives of sustainable mangrove forest management.

3. RESULTS AND DISCUSSION

3.1 Stakeholders Present and Engaged in Mangrove Conservation

There were four categories of stakeholders present and involved in conservation of mangrove forests in Mida creek and Gongoni-Marereni mangrove ecosystems. These stakeholders included government agencies, civil society organizations, private sector and local community (Table 1). Stakeholder presence and engagement in mangrove conservation varied with some present in both sites, and others absent. Mida creek is marine protected area and UNESCO Biosphere Reserve [24], hence attracts more stakeholders especially the government agencies such as Kenya Wild life Service (KWS) and Kenya Marine and Fisheries Research Institute (KMFRI) in conservation of the mangrove ecosystems.

Stakeholders had varying roles in conservation of mangroves influenced by their mandates and interests. Local community had interest and enthusiasm in mangrove conservation and had put more effort through community-based

organization and self-help groups involved in rehabilitation and restoration of mangrove forests [25,15]. In Gongoni-Marereni, the local community played a great role in conservation, however, their progress was slow due to lack of proper organization and management [26], and low awareness creation and capacity building due to little involvement of the NGOs and government [27].

The impact of NGOs in mangrove conservation was greater in Mida creek a UNESCO Biosphere Reserve because of its international significance as opposed to Gongoni-Marereni [28]. The salt firms in Gongoni-Marereni area had put little effort in conservation of mangroves as they concentrated in making more profits through the expansion of the salt ponds to increase the total volume salt produced. Hoteliers in Mida creek participated in mangrove conservation in various ways such as donations to conservation projects, observation of national and international environmental events, and development of community eco-tourism projects [20].

3.1.1 Multi-stakeholder interventions/ measures in conservation of mangrove ecosystems

In the two sites, stakeholders had different functions and efforts in conservation of the mangrove ecosystems. Awareness creation and education was a general intervention/measure to all stakeholders and others exclusive to some

stakeholders based on their varying mandates and interests (Table 2). Government agencies especially KFS has exclusive role in implementation of the law and mangrove forest management plans and mediation between the community and stakeholders in order to help to resolve conflicts when they arise such as the community and salt companies land conflicts in Gongoni-Marereni. Multi-stakeholder efforts include education and awareness creation; local community capacity building; provision of alternative sources of livelihood such as ecotourism; conducting research and dissemination of information on conservation of mangrove ecosystems and mangrove restoration; and funding the process and implementation of forest management plans.

Success rates of the interventions/ measures in conservation and management of mangrove forests by stakeholders were variable in the two study sites (Fig. 2). Higher success rates of interventions/ measures in conservation of up to 96.97% were achieved in Mida creek as opposed to Gongoni-Marereni which had 65.22%. Majority of the government agencies and NGOs operate in Mida creek and some have offices around or near to the creek hence they can achieve a higher success rate of implementing the conservation measures/interventions. Mida creek mangrove ecosystems conservation activities were successful, more effort should be directed to sustaining awareness among the community

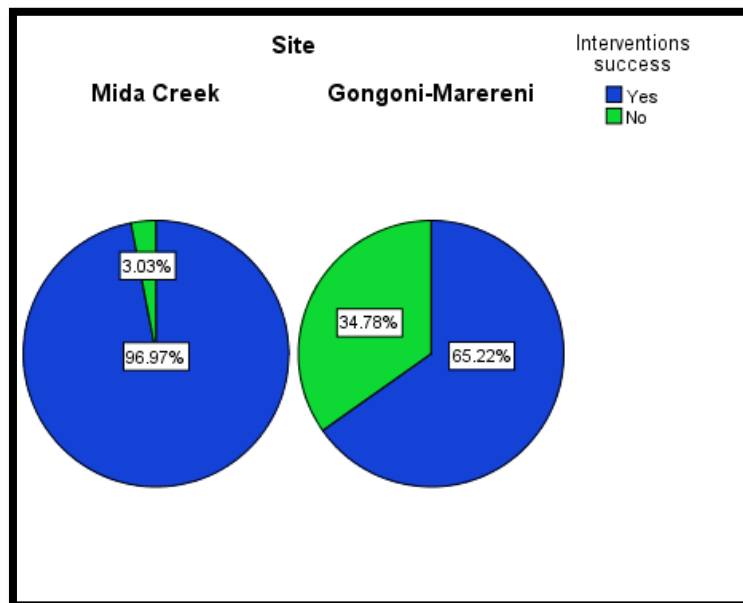


Fig. 2. Performance of interventions

Table 1. Stakeholders identified in the two study sites

Stakeholder Category	Stakeholder	Mida Creek	Gongoni-Marereni
Government Agencies	Kenya Forest Service (KFS)	✓	✓
	Kenya Forest Research Institute (KFRI)	✓	
	Kenya Wildlife Service (KWS)	✓	
	National Museum of Kenya (NMK)	✓	
	Kenya Marine and Fisheries Institute (KMFRI)	✓	✓
Non-Governmental Organizations (NGOs)	A Rocha Kenya	✓	
	Community Based Environmental Conservation (COBEC)	✓	✓
	Nature Kenya	✓	
	Local Ocean Conservation (LOC)	✓	
	Watamu Marine Association (WMA)	✓	
Private Sector	Hotels	✓	
	Salt Firms		✓
Local Community	Community Based Organizations(CBOs)	✓	
	Community Forest Associations (CFA)	✓	
	Village Development Forest Community Conservation (VDFCC)	✓	✓
	Self-help groups	✓	✓

Table 2. Interventions/measures employed by stakeholders in conservation of mangrove ecosystems

Stakeholders	Actions of stakeholders in conservation of mangroves	
	Mida creek	Gongoni-Marereni
Government agencies KFS, KWS, KEFRI, NMK, KMFRI	Implementation of laws & mangrove forest management plans KFS &KWS Security, management & protection of mangrove forests KFS &KWS Creating awareness in the community Technical support & organizing planting activities KFS, KEFRI, KMFRI Conducting research on various species & their zonation NMK, KEFRI & KMFRI	Implementation of laws & mangrove forest management plans KFS & KWS Security, management & protection of mangrove forest KFS
NGOs COBEC A Rocha Kenya Nature Kenya LOC WMA	Awareness creation Offering education to community members Conducting research on mangrove species & their zonation Providing incentives & donations to conservation groups & motivation Organizing tree nursery establishment & tree planting activities	Awareness creation Offering education to community members
Private sector Hotels Salt firms	Awareness creation Offering education to community members Providing incentives & donations to conservation groups & motivation Organizing tree nursery establishment & tree planting activities	Awareness creation
Local community CBOs CFA VDFCC Self-help groups	Awareness creation Nursery establishment Mangrove tree planting Security & protection of mangrove forests (community forest guards) Beach cleanup activities Ecotourism	Awareness creation

members to help reduce the illegal harvesting activities and bait harvesting. Disparities in working relations in the multi-stakeholders need to be ironed out to enable them to work in harmony and complement each other roles and optimize conservation results and outcomes.

There is a serious need to incorporate approaches that will regulate the salt firms' activities, such as releasing brine into the mangroves and expansion of salt ponds, in a more environment friendly manner through the development of an area-based management plan within Gongoni-Marereni area [20]. Lower success rates of interventions/measures in Gongoni-Marereni area were attributed to low presence and involvement of stakeholders with low levels of coordination and cooperation [29]. KFS, a government has low levels of patrols and implementing laws and regulations to curb illegal cutting of mangroves as it is located several kilometers away.

More awareness and education on the importance of mangrove ecosystems conservation needs to be done as the local community members, some were members in the CFAs and VDFCCs, in Gongoni-Marereni were involved in illegal harvesting of mangrove trees. The community members had inadequate/lacked information on the importance of the forests and were involved in the conservation exercise and thus engaged in illegal harvesting of mangroves [28]. COVID19 pandemic caused massive job losses which forced many of the community members to harvest mangroves for their livelihoods. Incentives and training of the local community in alternative livelihood programs such as ecotourism, aquaculture, beekeeping among others is necessary to conserve the mangrove ecosystems.

4. CONCLUSION

A variation in the multi-stakeholder participation was observed in the two study sites. More stakeholders were present and had a greater participation in mangrove conservation in Mida creek than in Gongoni-Marereni. Multi-stakeholder involvement was more effective in conservation of mangrove ecosystems in Mida creek compared to Gongoni-Marereni. Success of the interventions/measures in conservation of mangrove ecosystems was higher in Mida creek because of more stakeholders involved as

opposed to Gongoni-Marereni. Mangrove ecosystems were more degraded in Gongoni-Marereni as a result of low level of multi-stakeholder participation. Multi-stakeholder approach was generally inadequate in Gongoni-Marereni area compared to Mida creek.

5. RECOMMENDATION

Adoption of a multi-stakeholder approach in designing of multi-stakeholder participation framework as it has proved to be more effective in mangrove forest resources management. Design and implementation of a multi-stakeholder participation framework for each mangrove forest site will promote and encourage individual stakeholders to effectively participate in mangrove forest conservation and management at differing capacities.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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