

Full length Research paper

Challenges in mangrove ecosystems conservation: Multi-stakeholder participation in Mida creek and Gongoni-Marereni mangrove ecosystems in Kilifi County, Kenya

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Multi-stakeholder approach improves conservation of natural resources especially where a functional coordination framework exists. A comparison of two sites, Mida creek and Gongoni-Marereni, was carried out in relation to stakeholder challenges in conservation of mangrove ecosystems. Semi-structured interview questionnaires were administered to key informants to collect data from stakeholders. Mangrove ecosystems in Gongoni-Marereni were exposed to more threats, hence more degraded, while in Mida creek had less threats and in good conditions. There were notable variations in multi-stakeholder challenges in mangrove conservation in the two sites. Mida creek had more stakeholders with a functional coordination framework compared to Gongoni-Marereni. In both study sites stakeholders had unique challenges. More benefits of mangrove ecosystems were derived by stakeholders in Mida creek than in Gongoni-Marereni.

Key words: Challenges, Multi-stakeholder, Multi-stakeholder participation, Mangrove ecosystem, Threats

INTRODUCTION

Mangrove forests play important ecological and socio-economic roles to the marine ecosystems, the local community and national economic development in Kenya. The benefits of mangroves include improved livelihoods for the coastal communities, provision of environmental goods and ecosystem services (Government of Kenya, 2017). They act as a breeding ground, improve food security, act as carbon dioxide sinks, and habitat for a wide variety of wildlife (Buffle, Thi, Thomsen, 2005). Even though numerous benefits are derived from them, there is a continued exploitation of the mangrove forests to meet the demand of their products and land use activities (Abuodha, Kairo, 2001; Dahdouh-Guebas, Verneirt, Cannicci, Kairo, Tack, Koedam, 2002; Kairo, Guebas, Gwada, Ochieng, Koedam, 2002; UNEP, 2020).

Natural or anthropogenic threats affect mangroves which

cause destruction of mangrove forests resulting into a reduction of the forest cover. The natural catastrophes include siltation, rise in sea level, and prolonged flooding while human threats are related to rapid population growth, urban development, poverty, inequality, poor governance and industrial development (UNEP, 2020). Significant reductions in mangrove forest cover result from conversion into mariculture and agriculture, cutting for fuel wood and charcoal, timber and building material harvesting, and industrial and infrastructure development (Huxham, Emerton, Kairo, Munyi, Abdirizak, Muriuki, Briers, 2015). Multi-stakeholder participation improves the quality of decision making thus leading to a better policy and more legitimate, effective, efficient, and sustainable implementation (Healey, 1998; Holmes, Scoons, 2000). Effective partnerships may be overshadowed by multi-stakeholder multiple and different priorities, failing to honor set agreements and unexpected changes in personnel in conservation projects. They may culminate in to hick ups in the smooth running of the activities (UNDP, 2006; Ayala-Orozco, Rosell, Merçon, Bueno, Alatorre-Frenk, Langle-Flores,

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Lobato, 2018; Arumugam, Niyomugabo, Dahdouh-Guebas, 2020; Forkam, Ajonina, Ajonina, Tchamba, 2020; Mekuria, Hailesalassie, Tengberg, Zazu, 2021). Failure in implementation of natural resource policy in developing countries may be attributed to inability to match the desires and priorities of the targeted groups. This is caused by lack of or inadequate participation of multi-stakeholders and the public when crucial decisions were made (Gaventa, Robinson, 1998; Cornwall, Geventa, 2000).

STUDY AREA

The two sites, Mida Creek and Gongoni-Marereni Mangrove forests are located in Kilifi County in the North Coast of Kenya and are separated by a distance of about 68Km. Mida creek mangroves are separated naturally by

the main creek into two islands, which are Kirepwe and Uyombo (Kitheka, Mwashote, Ohowa, Kamau, 1999). Mangroves in Gongoni-Marereni area are a combination of riverine, creek and fringing types separated by small creeks and are generally overexploited and converted for salt harvesting (Bundotich, Karachi, Fondo, Kairo, 2009). The two sites are in the north coast of Kenya and have fairly similar climate which is hot and humid with temperatures in between 24°C - 35°C and the average annual rainfall in between 500mm – 900mm. Maximum humidity levels of up to 90% occur in the rain season, but the average relative humidity is generally high throughout the year. Long rains (March to May) occur during the South East Monsoon and the short rains (October to December) occur during the North East Monsoon (Kitheka, Mwashote, Ohowa, Kamau, 1999; Government of Kenya, 2009; Kenya Forest Service, 2015).

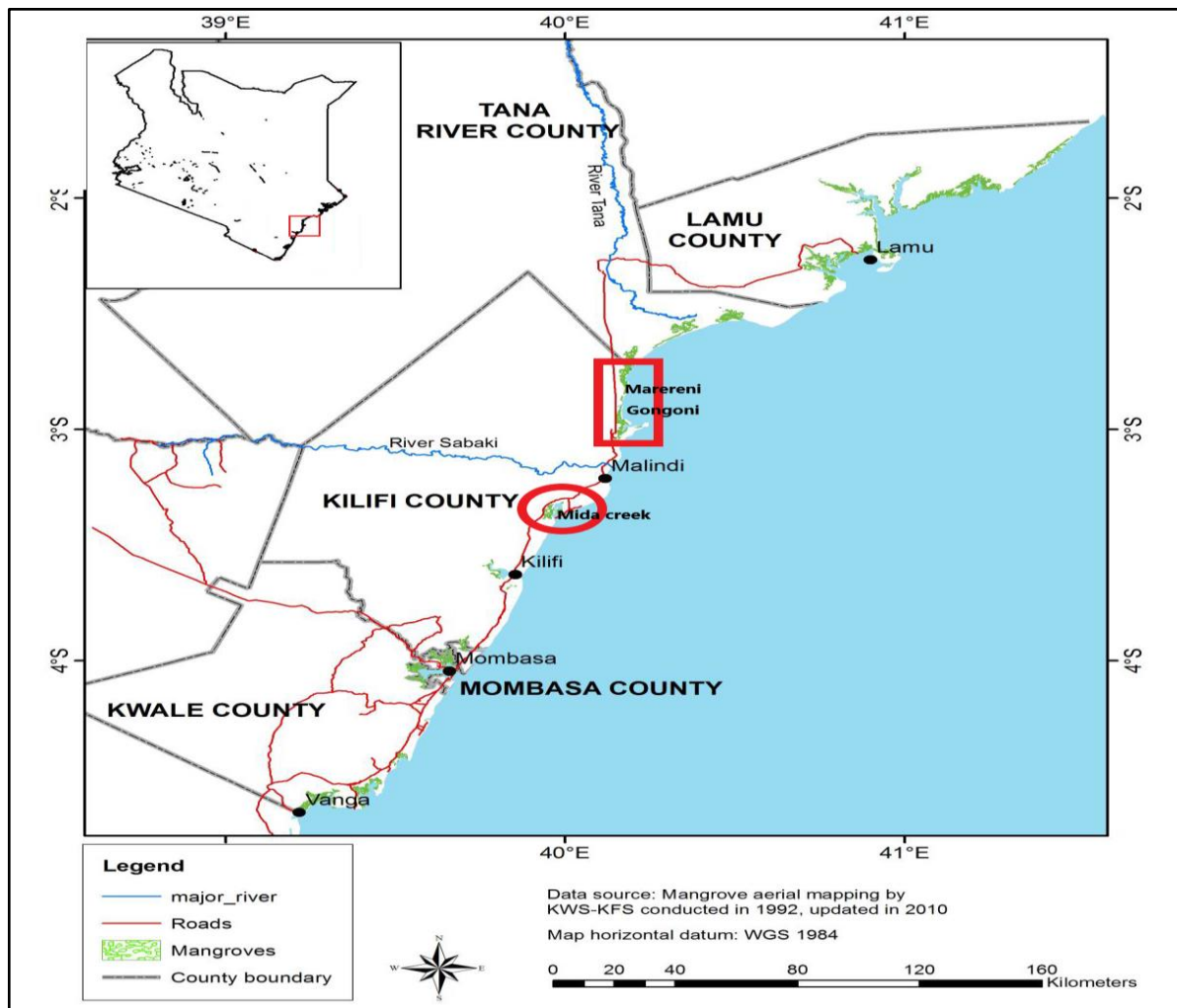


Figure1: Map showing the location of the study sites. (Source: Government of Kenya, 2017)

METHODS

Because of difficulty in assigning random participants to different levels of stakeholders in mangrove conservation a quasi-intervention model was used. The estimate population of 60 multi-stakeholders engaged in mangrove conservation in four categories were operating in the two study sites, drawn from clusters of the government agencies, civil society, private sector and local community. The formula by Daniel 1999 and a 5% confidence level were used to derive a sample size of 15 Key Informants which were interviewed.

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

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.

Semi-structured interview questionnaires were used to execute in-depth Key Informant Interviews in the local community, private sector, NGOs and the relevant government agencies to gather data. Experienced members of local community groups and management

level personnel were used as key informants. The Statistical Package for Social Sciences (SPSS) version 21 was used for data entry, and categorization to produce frequency tables and charts. Utilization and dependency on mangroves were evaluated by pair-wise ranking comparison procedure and results used to explain the challenges in stakeholders' involvement in the mangrove conservation efforts.

RESULTS AND DISCUSSIONS

Mangrove ecosystems threats in Mida creek and Gongoni-Marereni areas

Several site-specific threats were observed in mangrove forest ecosystems, and to a large extent Gongoni-Marereni mangrove forests were more threatened (Table 1). Impacts of the threats were maximum and the ecosystems could not regenerate without interventions. The major impacts were related to the salt firms' conversion of mangrove forests into salt ponds and development of trading centers around the salt firms. Minimal threats were recorded in Mida creek mangrove ecosystems and at low levels of occurrence that the ecosystems could regenerate.

Table 1: Current threats to mangrove forests

<i>Mangrove forest threats</i>	<i>Mida creek</i>	<i>GongoniMarereni</i>
<i>Urban development</i>		✓
<i>Increased demand for fuel wood and charcoal</i>	✓	✓
<i>Clearance for agriculture</i>		✓
<i>Pollution resulting improper waste disposal</i>	✓	✓
<i>Increased investment in salt harvesting</i>		✓

In general, the mangrove forests in Gongoni-Marereni area were degraded and the trend was on the rise due to demand for more land by salt companies to set up more salt ponds that has led to uncontrolled clearing of mangrove forests (Gordon, Bunyasi, Asoka, Pacha, Mbugua, Mbuthi, Kamau, 2013). The damage was catalyzed by the COVID-19 pandemic progression where massive job cuts due to government closure of businesses to control the spread of disease. The local community members had no option, but to harvest mangroves for their livelihood (Ogada, 2020). Poverty levels are relatively high and drives many to rely on direct harvesting of mangroves for their livelihood (Arabuko-Sokoke Forest Management Team, 2002). The population growth is high in Gongoni-Marereni area which increased demand for more land for settlement, building materials, charcoal, fuel wood, conversion of more land for agriculture and setting up of industries. Release of untreated salt brines from salt industries were a great danger to the remaining mangrove forests (Lugomela, 2012).

Few stakeholders were present in Gongoni-Marereni and the level of participation was low. For instance, the government agency which is charge of enforcement of forest law and policy had a low effort in surveillance and patrol. The situation was worsened by lack of site-specific Mangrove Management plan to guide on management and conservation (Bundotich, Karachi, Fondo, Kairo, 2009). The Local communities felt the consequences of the poorly managed mangrove forests which included low production in artisanal fisheries a major source of livelihood, unemployment and food insecurity; climate change; reduced protection from soil erosion and winds from the sea which at times destroy property; and habitat loss for many creatures (Sawhney, Kobayashi, Takahashi, King, Mori, 2007; HRW, 2015). Gongoni-Marereni mangrove forest ecosystems were still under pressure and threats ranging from coastal urbanization, demand for construction and building materials, salt harvesting, aquaculture, fuel wood, charcoal, logging sand climate change (DRSRS, 2013).

At Mida Creek there was a greater multi-stakeholder participation in conservation of mangrove ecosystems and significant appreciation of ecological functions and economic value by the local communities, hence minimal threats (COBEC, 2015). This may be attributed to the status of Mida creek mangrove ecosystems as UNESCO Biosphere Reserve and a marine protected area (SeaTrees, 2021). The duo status had attracted more stakeholders and had put more efforts in conservation which has improved the mangrove ecosystems goods and services.

Mangrove forests act as an interface between the land and sea, source of food, breeding ground for marine and terrestrial organisms, sustenance of alternative livelihoods such as ecotourism and beekeeping, medicine and protection against catastrophic events such as reducing

shoreline erosion and sea winds (Government of Kenya, 2017).

Stakeholder challenges in conservation of mangrove forests

Stakeholder challenges were variable and unique for each site based on the multi-stakeholder participation levels (Table 2). The challenges were ranked by the respondents based on a significance scale of 1 to 5 with 1 representing least and 5 most significant. The challenges in conservation of mangrove ecosystems were more felt by the stakeholders in Gongoni-Marereni than in Mida creek. Presence of few stakeholders, low levels of involvement and coordination attributed to the greater significance of the challenges in Gongoni-Marereni.

Table 2: Stakeholder challenges in conservation of mangrove forests

Category of stakeholder	Challenges faced by stakeholders			
	Mida creek	Rank	Gongoni-Marereni	Rank
Government agencies <i>Kenya Forest Service (KFS), Kenya Wildlife Service (KWS), Kenya Forest Research Institute (KEFRI), National Museums of Kenya (NMK), Kenya Marine and Fisheries Research Institute (KMFRI)</i>	Animals grazing in nursery areas	1	Clearing land in order to set up more salt ponds	1
	Bait harvesting within mangrove areas	2	Inadequate of patrols due to withdrawal of KFS guards	2
	Fuel need (firewood and charcoal burning)	3	Fuel need (firewood and charcoal burning)	5
	Animals grazing in nursery areas	2		
	Fuel need (firewood and charcoal burning)	3	Fuel need (firewood and charcoal burning)	5
			Uncontrolled brine released from salt companies	4
NGOs <i>Community Based Environmental Conservation (COBEC) A Rocha Kenya Nature Kenya Local Ocean Conservation (LOC) Watamu Marine Association (WMA)</i>			Inadequate restoration activities in degraded areas	5
	Animals grazing in nursery areas	1	Uncontrolled brine released from salt companies	4
	Bait harvesting within mangrove areas	2	Inadequate education and awareness	5
	Fuel need (firewood and charcoal burning)	3	Fuel need (firewood and charcoal burning)	5
Privatesector <i>Hotels Salt firms</i>				
Localcommunity <i>Community Based Organizations (CBO) Community Forest Association (CFA) Village Development Forest Community Conservation Self-help groups</i>				

Participation in conservation of mangrove ecosystems was greatly influenced by awareness and education among the local community members. These factors encouraged or inhibited the local communities in active participation in conservation of mangrove forests (Lugomela, 2012). Inadequate local community awareness, education and

capacity building was inhibiting many community members to engage in mangrove forest conservation especially in Gongoni-Marereni (Holmes, Scoones, 2000). Inadequate/lack of awareness and education in mangrove forest services as opposed to direct goods extracted such as biodiversity conservation, carbon sequestration,

shoreline protection, alternative livelihoods sustenance such as ecotourism, beekeeping, and proceeds from carbon credits through restoration. This knowledge would encourage the local community to actively participate in mangrove forests conservation in Gongoni-Marereni (COBEC, 2015). Poverty made local community members to view mangroves as their only possible source of income through sale of poles, charcoal and fuel wood especially in Gongoni-Marereni area. Efforts to reduce local community poverty levels through training and support in alternative livelihoods are critical in conservation of the mangrove ecosystems (Arabuko-Sokoke Forest Management Team, 2002).

Lack of site-specific mangrove management plans and spatial plans to guide land use activities led to uncontrolled release of untreated salt brines, increased conversion of mangroves into salt ponds, agriculture and settlements (Saenger, Hegerl, Davie, 1983; UNEP-Nairobi Convention/USAID/WIOMSA, 2020). Weak governance structures combined with the lack of a site-specific management plan made it difficult to resolve the problem of the ever-reducing mangrove forest cover in Gongoni-Marereni (Lugomela, 2012). The local community and NGOs operating in Gongoni-Marereni had at several times lobbied to the national and County governments and to the salt firms to support the development of the site mangrove management and spatial plan, but their efforts did not yield any fruits (COBEC, 2015). Illegal harvesting of mangroves was rampant because of inadequate patrols and surveillance by the responsible government agency which is stationed about 68 Kilometers away in Gedi and with no community guards on the ground to assist (Kairu, Kotut, Mbeche, Kairo, 2021).

Major challenges faced by stakeholders in Mida Creek included uncontrolled animal's grazing in nursery areas, bait harvesting in mangrove areas and harvesting of

mangroves for fuel wood and charcoal which affected mangrove regeneration particularly nurseries. Presence of more stakeholders including the key government agencies such as Kenya forest Service (KFS) and Kenya Wildlife Service (KWS) and the enhanced surveillance and patrols had led to increased compliance with the existing laws & regulations. Multi-stakeholder participation in mangrove conservation has contributed into the development and implementation of Area-based Mangrove Management Plan (Kenya Forestry Service, 2015). Cooperation and coordination of stakeholders had helped in managing the challenges and hence the Mida creek mangrove ecosystems are well conserved. However, more efforts are required to sustain the awareness and education in the local community in conservation of mangrove forests (UNDP, 2016; Ayala-Orozco, Rosell, Merçon, Bueno, Alatorre-Frenk, Langle-Flores, Lobato, 2018; Arumugam, Niyomugabo, Dahdouh-Guebas, 2020).

Benefits derived by stakeholders involved in mangrove conservation

Local mangrove use dependency and use was identified by applying the pair-wise ranking procedure and use preference depended on presence and impacts of stakeholders within the two sites (Table 3). Mangroves were preferred for building materials in Gongoni-Marereni and in Mida creek the perceived most important use was related to stakeholder's occupation such as ecotourism, fishing and apiculture. Variation in mangrove uses were noted in the two sites, with functions such as breeding ground for fish or boardwalks for ecotourism activities were not reported in Gongoni-Marereni. Differing benefits were derived by government agencies even though some were present in both sites and the NGOs mostly benefited in Mida creek than in Gongoni-Marereni area.

Table 2: Benefits derived from mangrove conservation by stakeholders

Stakeholder category	Benefits in mangrove conservation			
	Gongoni-Marereni	Rank	Mida creek	Rank
<i>Government agencies</i>	Reduces soil erosion	5	Habitat and breeding ground for fish	4
<i>KFS, KWS, KEFRI, NMK, KMFRI</i>	Source of rain	5	Shoreline protection	5
	Ecosystem functions	5	Ecosystem benefits	5
<i>NGOs</i>			Habitat and breeding ground for fish	4
<i>COBEC, A Rocha Kenya</i>			Shoreline protection	5
<i>Nature Kenya</i>			Ecosystem benefits	5
<i>LOC</i>				
<i>WMA</i>				
<i>Private sector</i>			Ecotourism /Aesthetic value	5
<i>Hotels</i>	Salt extraction	5		
<i>Salt firms</i>				
<i>Local community</i>	Building and construction material	1	Ecotourism /Aesthetic value	4
<i>CBOs</i>	Fuel wood	2	Medicine	2
<i>CFA</i>	Source of timber	3	Apiculture	3
<i>VDFCC</i>	Dye	4	Ecosystem benefits	5
<i>Self-help groups</i>				

Mangrove forests play important environmental, social and economic roles. The benefits range from carbon sequestration, nursery ground and habitat for many marine creatures, provision of food to multitude, clean water, shoreline protection, reduce soil erosion and a great resource to support human livelihood (Saenger, Hegerl, Davie, 1983; Lugomela, 2012; SeeTrees, 2021). Local communities are dependent on mangroves for their livelihood, food, provision of timber and building materials in both sites (Government of Kenya, 2017). However, the demand for timber and building materials was greater in Gongoni–Marereni as most houses were constructed by use of mangrove and sawn timber was sold in workshops in nearby townships (DRSRS, 2013). In both sites mangroves were breeding grounds for a large number of fish species, crabs and shrimps. Mangrove ecosystems in both sites supported the most community members livelihoods (mainly artisanal fishing) and food security (Lugomela, 2012). In Mida creek, alternative livelihood programs were initiated by the stakeholders and the local communities were doing mariculture, ecotourism and beekeeping which encouraged them to conserve the mangroves (COBEC, 2015; Eddy, Ridho, Iskandar, Mulyana, 2016). Community ecotourism helps in conservation of natural resources through increased surveillance and patrols and contributes to alternative livelihoods (Moisey, 2002; Sawhney, Kobayashi, Takahashi, King, Mori, 2007). Some of the projects were started in Gongoni-Marereni, but failed to take off due inadequate support from the few stakeholders present.

Local communities were given incentives for their participation in mangrove restoration by hoteliers and the NGOs which were implementing projects that involved planting of seedlings in Mida creek. This encouraged them to actively engage in conservation of mangroves. The local community in Gongoni–Marereni were not benefiting in such incentives and income generation activities which discouraged them to be actively involved in mangrove forests conservations (UNEP, 2020). Capacity building of the local community in Mida through training such as in tree nursery establishment and management, leadership, governance, record keeping and alternative livelihood programs e.g., beekeeping, aquaculture, and ecotourism had been conducted by both civil society and government institutions. The capacity of the local community in Mida was good as result of the presence of many stakeholders than in Gongoni–Mareren (COBEC, 2015).

Hotels in Mida Creek were benefiting a lot from the mangrove ecosystem through tourism activities such as boat/canoe rides, and mangrove boardwalk for tourists to explore the beauty of the marine ecosystem. More employment opportunities had been created and a source of income to the local community directly employed to carry out these activities (Sawhney Kobayashi, Takahashi, King, Mori, 2007). The hoteliers have been involved in mangrove restoration events that were organized by other

stakeholders as they saw the benefits mangroves have to their businesses. Salt firms in Gongoni–Marereni, benefited through conversion of mangrove areas for salt harvesting which was destructive (COBEC, 2015).

CONCLUSION

The challenges faced by stakeholders were unique to each site and had variable significance levels. Stakeholders in Gongoni-Marereni had no effective coordination structures and had more serious challenges compared to Mida creek. Mangroves in Gongoni-Marereni had more significant threats and highly degraded which could not allow natural regeneration. All the stakeholders in Mida creek derive maximum benefits in conservation of mangrove forests which was attributed to effective engagement structures as opposed to Gongoni-Marereni.

RECOMMENDATION

Preparation and implementation of site specific and clear strategic mangrove forest resources conservation and management plans. During the plan preparation phase the following need to be considered; site specific threats, multi-stakeholder involvement challenges, and conservation and management issues and concerns. Effective and efficient implementation of area-based plans will help to improve in utilization and management of the mangrove forests especially with a good multi-stakeholder coordination framework in place.

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