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Nature's Contributions to People:

Seagrass contributions to community livelihood in Gazi bay, Kenya

Acknowledgements

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Cover: Fishing activities in seagrass at Gazi . Photo by: **Tony/WILD**

About the Blue Forests Project

The Global Environment Facility's (GEF) Blue Forests Project is a global initiative focused on harnessing the values associated with coastal marine carbon and ecosystem services to achieve improved ecosystem management and climate resilient communities. The project is implemented by the United Nations Environment Programme (UNEP) with partners worldwide. Project sites include locations in Ecuador, Kenya, Madagascar, Mozambique, Indonesia, the United Arab Emirates, Thailand, and the United States of America. The project also addresses key 'blue forests' knowledge gaps, as well as providing experience and tools to support greater global replication and application of the blue forests methodologies and approaches.

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Nature’s Contributions to People:

Assessing seagrass contributions to community livelihood in Gazi bay, Kenya.

List of contributors

Gabriel Akoko-*Kenya Marine and Fisheries Research Institute*

Anne Wanjiru- *Kenya Marine and Fisheries Research Institute*

James Kairo- *Kenya Marine and Fisheries Research Institute*

Reviewers:

Micheal Njoroge-*Univerity of Embu*

Jacqueline Uku- *Kenya Marine and Fisheries Research Institute*

Edward Mutwiru- *Univerity of Embu*

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List of Acronyms

BMU	Beach Management Unit
CCA	Community Conservation Area
FGDs	Focus Group Discussions
KeFS	Kenya Fisheries Services
KMFRI	Kenya Marine & Fisheries Research Institute
PES	Payment for Ecosystem services
UNFCCC	United Nations Framework Convention on Climate Change

Abstract

- Seagrass ecosystems contributes a wide range of goods and services for human wellbeing.
- However, these benefits are declining due to continued losses and degradation.
- We used primary and secondary data, supplemented by Focus Group Discussion to understand seagrasses contributions to community livelihoods in Gazi, Kenya
- Some of the seagrass based livelihood activities in Gazi were identified as small scale fisheries, ecotourism, and integrated mariculture
- Promoting nature-based enterprises in seagrasses will enhance ecosystems integrity and productivity; at the same time increase nature's contribution to people.

1.0 Introduction

Nature contributes a variety of goods and services to the human society thereby improving the quality of life. However, over the past 50 years, studies show a decline in biodiversity and ecosystem's function, hindering natures ability to contribute to human wellbeing (Brauman et al., 2020). In the seascape ecosystems such as mangroves and seagrasses, declining trends in the functionality of these critical habitat puts their contribution at risk. This calls for recognition of their contribution and sustainable human-nature interaction.

Seagrasses are marine flowering plants that grow in shallow brackish and salty water in the intertidal and subtidal environments. They have a well-developed shoot and root systems that extend into the sediment for storage and absorption of nutrients as well as anchorage. They also flower and have thin cuticles allowing nutrients and gases to diffuse directly in and out of the leaves from the water. Globally, there are 72 species of seagrasses belonging to four major groups, distributed in the arctic, subtropical and tropical regions (Short et al., 2007; McKenzie et al., 2020).

The ability of seagrass meadows to bioengineer their environment enables them to support a wide array of faunal species; with an estimated 20% of the world's largest fisheries depending on this ecosystem in one way or another (Unsworth et al., 2018; Unsworth et al., 2019). The proximity of seagrasses to human habitation enhances fisheries functions thereby improving coastal livelihoods and wellbeing. By supporting other ecosystems such as corals, there is growing evidence that seagrass meadows reduce climate change related vulnerability on human population (Unworth et al., 2019). Despite the important roles played by seagrasses in climate regulation, as well as their economic and cultural values to the society, recognitions of their contributions to community livelihood and wellbeing remains limited when compared to mangroves and corals (Cullen Unsworth et al., 2014). Raising awareness of seagrasses and involving communities in their conservation is key in realizing sustainable utilization of this ecosystem. Equally important is the need to promote sustainable livelihood activities in seagrass areas.

Plate 1 : Seagrass meadows in Gazi Bay, Kenya. (Photo: KMFRI)

1.1 Valuing Seagrass Ecosystems

Seagrass ecosystems provide numerous cultural, provisioning, regulating and supporting services to human wellbeing (Duarte et al., 2013; Cullen Unsworth and Unsworth, 2013; Hejnowicz et al., 2015). In provisioning services, seagrass meadows provide habitat for feeding, refuge and breeding grounds for fish and other marine fauna. Global figures show that they support commercial fisheries valued at $ 47.8 million/yr (Green and Short, 2003). They also store organic materials within their systems which when transported to the adjacent ecosystems, support different terrestrial and marine consumers (Cullen Unsworth and Unsworth, 2013). As part of the regulatory services, seagrasses mitigate climate change through capture and storage of atmospheric carbon dioxide. The standing biomass in seagrass ecosystems has been estimated at 76 - 151 Tg C (Fourqurean et al., 2012). More than 50% of this carbon consist of allochthonous material. Additionally, more than 97% of the carbon is stored in the sediment (Boullin et al., 2007; Githaiga et al., 2017), making seagrass beds important carbon sinks.

Seagrass provide supporting services by facilitating nutrient cycling to the global economy estimated at $ 1.9 trillion, (Constanza et al., 2014). Indirect nutrient cycling involves seagrass metabolism and sediment cycling. Additionally, seagrasses play significant social-economic roles through provision of food security and livelihood to coastal communities. Valuation of fisheries in seagrass meadows has been estimated at US$3500 ha/yr (Waycott et al., 2009). In Africa, gleaning of shellfish among the artisanal fishers and invertebrate harvesting have improved the rural livelihoods through income generation ranging between US$ 8.51-17.01 per catch (Nordlund et al., 2018; Hejnowicz et al., 2015).

1.1.1 Seagrass and Climate Change

Similar to other blue carbon ecosystems, seagrasses capture and store huge stocks of carbon; consisting of both allocthonous C_{org}, autochthonous seagrass detritus, and the refractory below-ground biomass (Kennedy et al., 2010). Global emissions from loss and degradation of seagrass meadows potentially reaches 0.65 $GtCO_2$ per year, which is roughly equivalent to the annual emissions from the shipping industry (Hoegh-Guldberg et al., 2018). Seagrasses have the capacity to accumulate contaminants such as the trace metals. Their sensitivity to environmental changes and bioaccumulation capacity makes them useful as bioindicators of water quality (Marba et al., 2013).

Seagrasses produce bioactive secondary metabolites with antifungal and antibacterial activity to curb the increasing infections as a result of changing environmental conditions. For example, tropical species such as *Halophila stipulacea*, *Halodule pinifolia* and *Cymodocea serrulata* have been found to be active against *Staphylococcus aureus* (Kannan et al., 2010). The meadows also reduce wave energy at the coastline by about 40% minimizing strong waves and associated damages among coastal communities and systems. This helps coastal communities to adapt to sea level rise (Potouroglou et al., 2017). Given the significant role seagrass play in carbon capture and storage they could be included in climate change mitigation and adaptations; and many countries are including them in their nationally determined contributions (NDCs) to Paris Agreement

1.2. Seagrasses in Kenya

Seagrass is found along the 600 km Kenyan coastline making the marine ecosystem rich and productive. The coastline is characterized by limestone cliffs, sand dunes and beaches, fringing coral reefs, mangroves forests and numerous sheltered creeks and bays (Ochieng & Erftemeijer, 2003). With the large tidal amplitude, the intertidal zones between the coast and the fringing reefs are fairly extensive. Macro-algae and seagrasses predominantly determine the productivity of these ecosystems as they grow in the shallow depressions which retain water during the low tides. In many cases, extensive seagrass meadows are found in the back-reef lagoons which occur between cliffs or beaches and the adjacent fringing reefs.

There are about 12 species of seagrass in Kenya including *Halodule wrightii, Halodule uninervis, Syringodium isoetifolium, Enhalus acoroides, Halophila stipulacea, Halophila ovalis, Halophila* *minor, Thalassia hemprichii, Thalassodendron ciliatum, Cymodocea serrulata Cymodocea rotundata and Zostera capensis.* These species occur in both single and mixed stands. *Thalassodendron ciliatum* is usually a dominant species occurring mostly as mono-stand with higher biomass. The seagrass species also exhibit the common channels and creeks that run through the mangroves, thereby functioning as traps and also aid in reduction of flux rate of nutrient and particulate matter between the ocean and mangroves (Coppenjans *et al.,* 1992; Githaiga *et al.,* 2017). Major seagrass areas along the Kenya coast include *Funzi, Gazi, Kilifi, Chuda, Mida* and *Mtwapa*. In these areas, the coral reefs, mangroves and sea grass meadows occur adjacent to one another in the interrelated ecosystems. Other areas in Kenya where seagrass meadows are found include Kiunga Marine Reserve, Lamu, Diani – Chale lagoon and Shimoni (Gullstrom *et al.,* 2002; Ochieng & Erftemeijer, 2003).

1.3. Drivers of seagrasses in Kenya

Seagrass meadows in Kenya cover an area of about 317.1 ha with an estimated decline of 1.02% per year since 1986 (Harcout et al., 2018). Some of the direct drivers of the decline include coastal development due to the rising human population and unsustainable fishing methods while the indirect pressures include climate change impacts and eutrophication. In northern Kenya, seagrass decline has been attributed to degradation of the adjacent mangrove ecosystems for aquaculture and large-scale irrigation of rice. This increases turbidity and sedimentation thereby threatening seagrass productivity (Abuodha & Kairo, 2001; Kirui et al., 2013).

To enhance seagrass conservation, a deeper understanding of the natural environment and its contribution to the people is critical. Assessing perceptions on opportunities for people to sustainably interact with seagrass is key to increasing their awareness and empowerment. This report, discusses seagrass ecosystems uses and threats in Gazi Bay. It also provides insights into the community livelihood options associated the seagrass ecosystem in the bay.

1.4. Objectives of the study

The current study aimed at assessing uses and threats of seagrass ecosystems in Gazi bay, and community livelihood opportunities associated the system for their enhanced conservation. Specifically, the objectives were to:

a) Determine uses of seagrass among community members in Gazi bay
b) Assess threats of seagrass ecosystems in the bay
c) Determine community livelihood opportunities in seagrass ecosystems

2.0. Study approach and methodology

2.1. Description of the study area

Gazi bay is located in South coastal Kenya (4˚25’S, and 39˚30’E) and has a surface area of approximately 17 km^2. The bay is characterized by shallow water system with the mean depth less than 5 m. Mangrove forest cover 615 ha of the bay, with seagrasses extending from the intertidal to the subtidal areas (Fig. 2). Coral reefs are also found in the southern part of the bay, occurring in scattered patches. They harbor different species of organisms including molluscs, crustaceans, fish and echinoderms, thereby supporting biodiversity and coastal livelihoods through tourism and fisheries. The two tidal creeks (Eastern and Western creeks), originate from the open waters of the bay, penetrating through the mangrove forest.

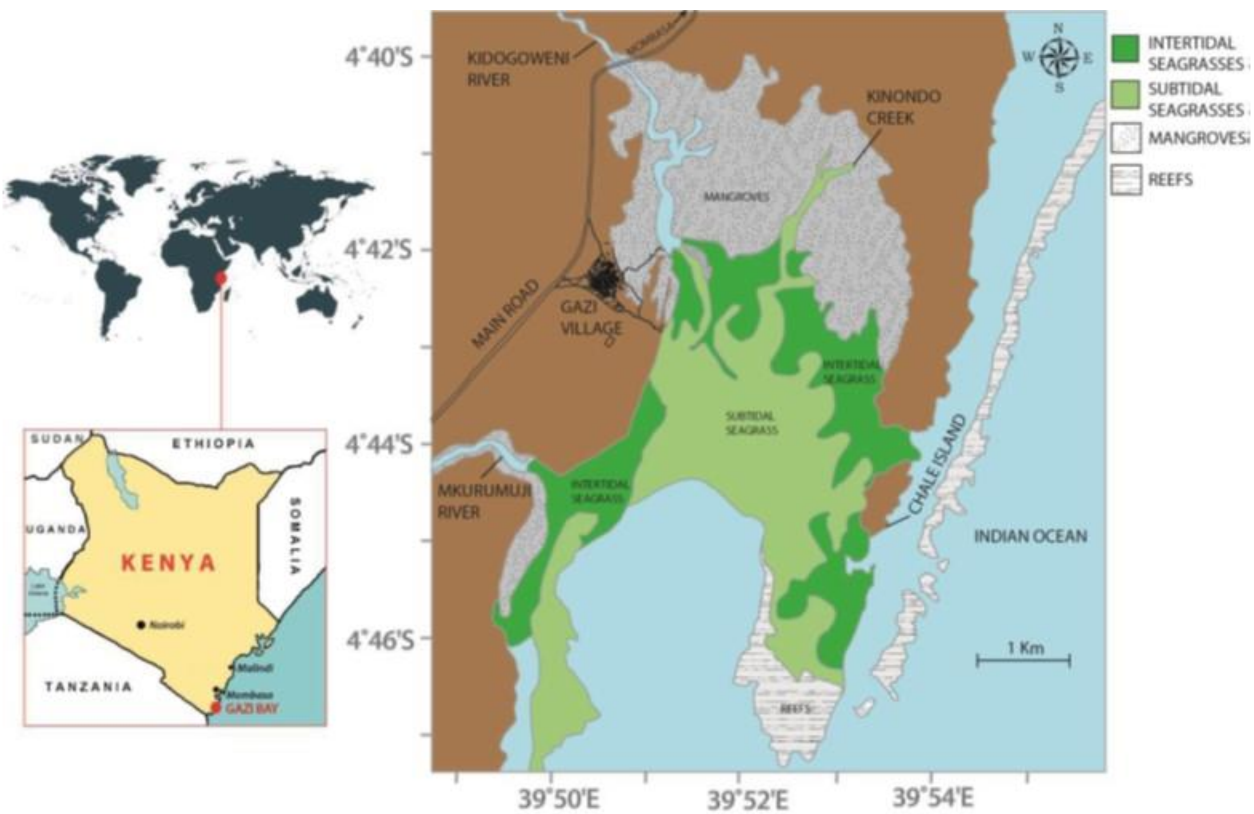

Figure 1: Map of Gazi bay showing mangroves and seagrass distribution in the bay (Githaiga et al., 2017)

2.2. Composition and Distribution of Seagrasses in Gazi bay

There are 955 ha of seagrasses in the bay represented by 12 species. The species either occur as single or mixed stands (Ochieng’ & Erftemeijer, 2003), with their coverage extending from the deeper subtidal to the mangrove fringed creeks in the rocky, muddy and sandy substrates. The dominant species are *Thalassodendron ciliatum, Thalasia hemprichii* and *Enhalus acoroides* that are majorly found in the eastern creek and intertidal parts of the bay. Other species including *Halophila minor, Halophila ovalis, Halodule writghtii* and *Halodule uninervis* are pioneer and short lived in the bay and majorly found in the disturbed western creek and the shallow intertidal zones (Juma et al., 2020). Other dominant species such as *Syringodium isoetifolium* and *T. ciliatum* are mainly found in the subtidal areas (Table 1).

Some seagrass species thrive in close proximity to other critical ecosystems including mangroves and corals thereby trapping sediment and reducing nutrient flux rate between the systems (Coppenjans et al., 1992; Githaiga et al., 2017). Human and natural threats on the seagrasses also easily impact the other systems.

Table 1: Seagrass species distribution in the creeks, intertidal and subtidal zones of Gazi bay

Species	Species Distribution			
Species	Western creek	Eastern creek	Intertidal	Subtidal
Halodule wrightii			x	
Halodule uninervis	x	x	x	
Syringodium isoetifolium			x	x
Enhalus acoroides	x	x	x	
Halophila stipulacea	x		x	
Halophila ovalis	x		x	
Halophila minor			x	
Thalassia hemprichii	x	x	x	x
Thalassodendron ciliatum		x	x	x
Cymodocea serrulata	x	x	x	
Cymodocea rotundata	x	x	x	
Zostera capensis			x	

2.3. Data Collection

The study used both primary and secondary data. We used a combination of search engines (Yahoo, Google Scholar, Science Direct etc.) in retrieving available data and information concerning seagrass in Gazi bay up to the end of the year 2020. The search terms used were 'seagrass' in combination with one of the following: "community", "livelihood", "fisheries" and "Gazi Bay". A total of 21 papers and reports were reviewed 5 of which were used in the study.

Table 2: Some of the articles retrieved and used for the study

Publications searched	**Subject**	**Publications used in analysis**
Mohammed master's thesis 2018 Harcourt *et al* 2018	Seagrass Mapping	Mohammed master's thesis 2018 Harcourt *et al* 2018
Hemminga *et al* 1994 Bouillon *et al* 2004 Bouillon *et al* 2007 Githaiga *et al* 2017 Githaiga *et al* 2019 Juma *et al* 2020	Seagrass Biomass & Carbon sources and stocks	
Hejnowicz *et al* 2015 UNEP 2020	Seagrass PES	Hejnowicz *et al* 2015 UNEP 2020
Coppejans *et al* 1992 Slim *et al* 1996 Marguillier *et al* 1997 Hemminga *et al* 1995 Coral and seagrass ecosystem conservation strategy (2014 – 2018)	Seagrass productivity	
Coppejans *et al* 1992 Mees *et al* 1995 Wakwabi *et al* 1998 De Troch *et al* 2001 De Troch *et al* 2001b De Troch *et al* 2003 Musembi *et al* 2019	Seagrass fauna and fisheries	Musembi *et al* 2019

The study was complimented by data gathered from stakeholder consultation conducted by KMFRI. Data on uses and threats facing seagrass and fishing methods & gears used in Gazi Bay was gathered through Focus Group Discussions with the Beach Management Unit (BMU) members. Mapping activities were also undertaken to find out where in the bay the activities were carried place.

3.0. Results and Discussion

Based on community consultations, support values of seagrasses to fisheries were ranked highest, with over 75% of artisanal fisheries taking place in seagrass areas locally referred to as *michipi* and *magambare*. Other uses highlighted included aesthetic value of the habitat, carbon sequestration, medicinal value and source of baits among others (Fig.2). Seagrass support for fisheries included provision of fishing ground, food for fish and breeding areas for fish. More than 60% of fishers directly benefit from this function in Gazi alone while over 75% of the 4000 population of Gazi indirectly depend on this function for their protein source (Musembi et al., 2019) (Figure 2).

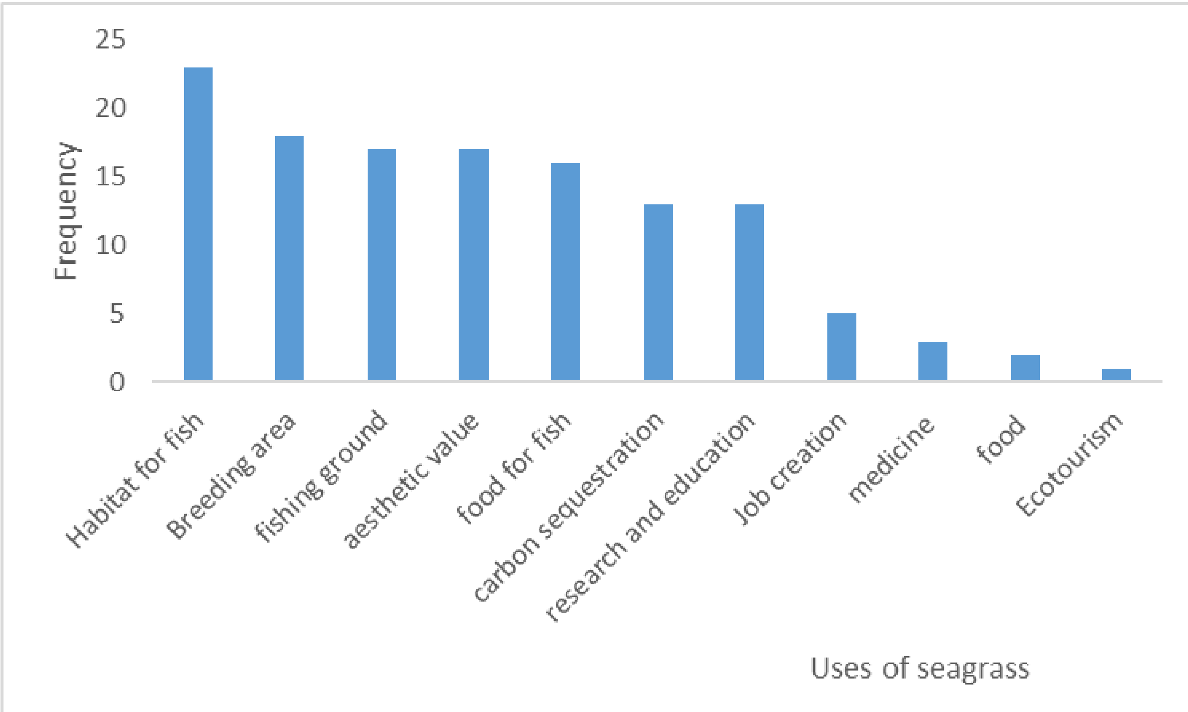

Figure 2: Figure showing the uses of seagrass as voted by the community members

Regarding the use of some seagrass species for medicinal purposes, the respondents indicated that they use *Enhalus acoroides* to treat flue, and ray sting by applying it in the stung area. In other cases, the fishermen and other gleaners along the shoreline use seagrass to understand tidal regime of the area. "*Tukiona majani ya magambari, basi tunajua ya kuwa maji ni machache*," (when we see the leaves of *Thalassodendron ciliatum* then we know that the tide is low). Communities also use seagrass to understand the direction of water current by observing the slant leaves.

3.1. Threats of seagrasses in Gazi Bay

From the analysis of available information, there are evidences of both gains and losses of seagrasses in Gazi Bay between 1987 and 2017. Most gains were observed in the eastern creek bordering community managed mangrove areas (Mikoko Pamoja). Our informants attributed this increase to limited fishing activities; community sensitization as well as enhanced patrols and monitoring.

In the middle intertidal zone of the bay, seagrass cover has declined at an estimated rate of 1.1% per year (Mohamed, 2018; Fig 3). The major contributor to the decline is the use of seine nets (b*uruta)* by the local fishermen. Over time, pressure on fisheries has increased in the bay due to the growing local population and immigration of fishermen from other areas during the South East monsoons (kusi). Additionally, establishment of seaweed farms in the bay has reduced seagrass areas through tramping. Other human associated drivers including unsustainable crab fishing and changes in estuarine flow due to water abstractions up streams were also found to threaten seagrass ecosystems in the bay

In most parts of the bay, poor fishing practices were still ranked high followed by strong wave actions that were indicated to destroy some seagrass species such as the *S isoetifolium*. This occurs during the ebb tides and during the southeast monsoon when the sea is usually rough. Herbivory by sea urchin (*mafuma*) was also observed to impact on seagrass species, *T. ciliatum.* Additionally, sedimentation loading and siltations from R. Kidogoweni and R. Mkurumudji during the rainy season have been observed to affect seagrass meadows in the bay (Juma et al., 2020). Other factors noted included erosional processes and diseases that cause seasonal drying and detaching of leaves.

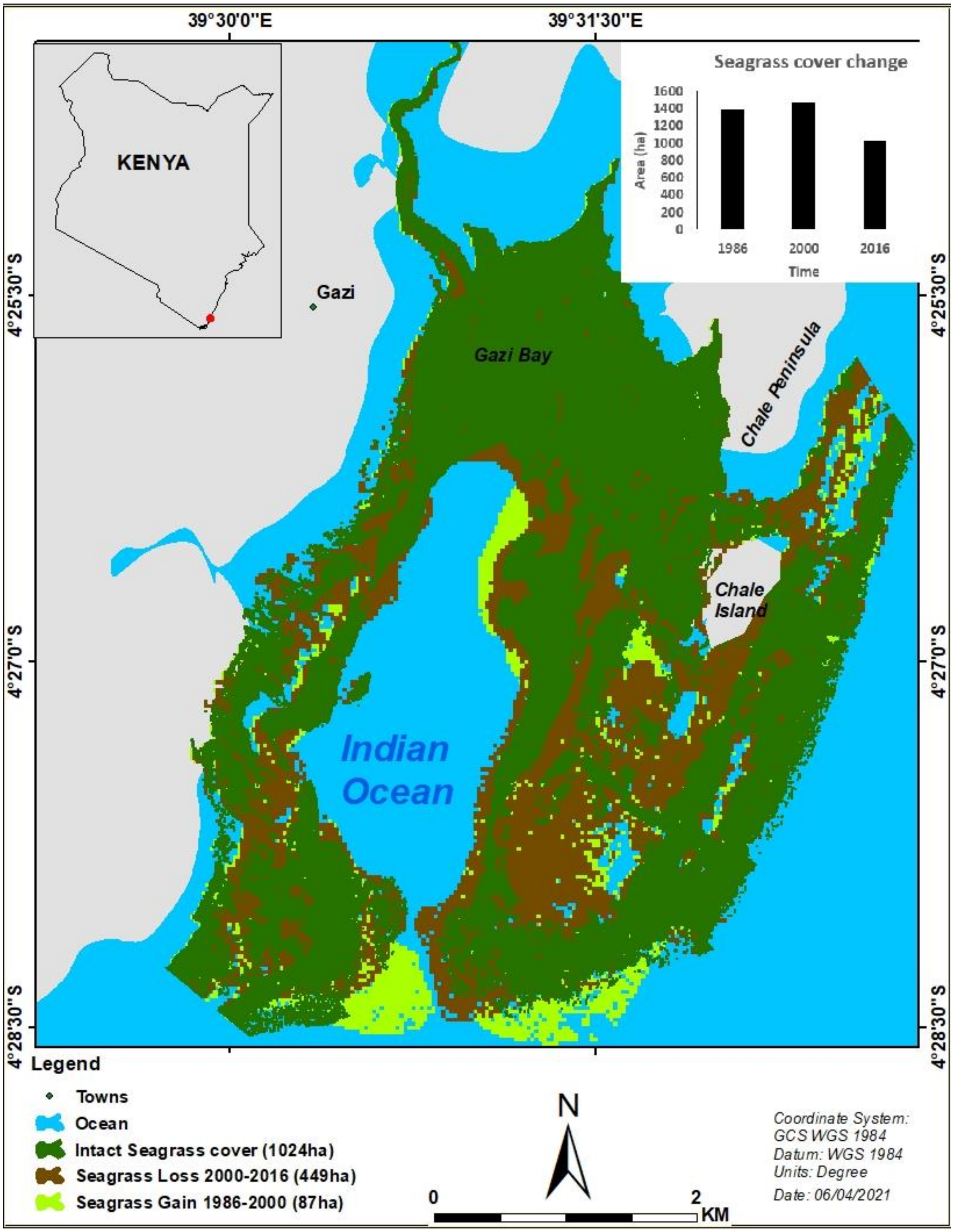

Figure3: Sea grass cover change at Gazi Bay between 1987 to 2007

3.2. Livelihood activities associated with seagrasses in Gazi bay

3.2.1. Small scale fisheries

Artisanal fishing activities were identified as one of the livelihood options that seagrass meadows contribute to the people. Seagrass ecosystem in the Bay support high diversity of fish including the common commercial groups; parrotfish (pono) emperors (*changu*), snappers (*tembo*), rabbitfish (*tafi*), eels *(mikunga*), cuttlefish (*madome*) and goatfish (*mkundaji*). The dominant fishing gears include; basket traps, nets (cast nets, monofilament nets, gillnets and reef seines), handline and spear gun This was supported by our informants during the consultations. (Table 2). During low spring a large part of the seagrasses in the bay are exposed enabling local fishers to harvest fish and invertebrate resources by foot using sticks and hand collection.

Table 3: Table showing fishing gears used in Gazi Bay

Fishing gear type	Description
Passive gears	
Basket trap (Lema)	A simple fishing gear mostly used by foot fishers or dugout canoe users that uses basket as a trap
Set gillnets *(Jarife, nyavu ya kutega)*	Gill nets made of multi-filament nylon, suspended with floats and held vertically with sinkers. Set on or near the bottom but often catch pelagic.
Hook and Stick *(Njoro)*	A fish hook is a device for catching fish either by impaling them in the mouth. The hooks are normally attached to some form of lines/stick
Active gears	
Ringnets *(nyavu ya kufunga)*	A multifilament nylon mesh netting similar to a purse seine suspended from floats and weighted at the bottom to hold the net vertically in the water. A foot-rope threaded through metal rings at the bottom of the net is used to close the net (hence the name "purse") to enclose a school of fish.
Chachacha	a traditional gear used to catch half beaks
Beach and reef seine *(Juya, buruta, nyavu ya kukokota)*	Small variable mesh sized nets made of multifilament nylon with a floatline and a weighted footrope. A section of larger-mesh netting on each wing of the net corals fish towards the smaller-mesh centre of the net. potential negative impact of seine may consist in the by catch/discards (undersize specimens, no marketable specimens, non-target species, etc.
Handline (*Mshipi)*	A single monofilament nylon line attached to one or more steel hooks onto which baits are fixed.
Cast nets *(kimia/ kutupa)*	Circular nets often made with monofilament nylon line, with weights attached around the edge. They usually comprise three parts: the upper section, the middle section and the weighted lower section. A foot-rope is used to close the net during retrieval.
Fence traps *(uzio, rasaka, wando)*	Stationary semi-permanent traps and fences set in the intertidal zone. Usually made of mangrove stakes, plaited mats, or palm frond with midribs tied tightly together.

Mosquito nets (*Upindo*)	Use of mosquito nets as gear to catch young fish and prawns *(Duvi)*
Spear guns (*Bunduki*)	An underwater fishing device designed to launch a tethered spear or harpoon to impale fish or other marine animals
Monofilament *(Nyavu ya mkano*)	This is a net that is made of single strands of a synthetic material that looks like a stand of modern fishing line. A monofilament net is preferred by fishermen because it catches 2-4 times as many fish as a multifilament net. The main reasons include the low visibility of nets in the water, and the different way the nets catch fish; fish in the monofilament nets are mostly gilled (caught around the gills with their head through the net
Poison (*sumu*)	Use of herbal fish poison to catch fish. The method is forbidden but it is still practiced illegally

Beach seine was cited as a fishing method contributing most to the seagrasses decline. Other factors identified to be threatening sustainable fisheries activities in the area included seagrass include sea urchins, small sized nets and use of chemicals. To abate destructive fishing activities, some of the measures have been establishment of community conservation areas (CCAs) that are designated and demarcated as no-take areas.

Promoting sustainable fishing practices, non-destructive land-use and communicating the importance of seagrass habitats should be at the forefront of management strategies. When done sustainably, fisheries in the seagrass meadow can consequently support the local communities through provision of food and thus sustain livelihoods. This can be through modification of existing fishing methods and strict enforcement of existing legislation. Gear restriction can also be enhanced to ban use of beach seines, spear guns, gill nets is not allowed. These management measures can lead to recovery of fish populations leading to increased catches and size of fish and recovery of degraded habitats such as coral reefs and seagrass bed.

3.2.2. Ecotourism

Ecotourism was identified as another potential livelihood opportunity in seagrass areas. Together with mangrove ecotourism, Gazi Bay has a potential to develop as a seagrass ecotourism site since it has all the 12-seagrass species found in Kenya. The bay began to develop as an ecotourism destination following the implementation of the Gazi women mangrove boardwalk in 2008.

The 500m boardwalk built within the mangrove ecosystem has been an attraction to both local and international tourists. Integration of seagrass with mangrove and coral reef ecotourism has the potential to elevate the conservation status of seagrasses ecosystem alongside boosting the livelihood of the local communities. Engagement of some of the local fishermen in ecotourism activities can also reduce pressure on marine resources.

3.2.3. Seagrass Payment for Ecosystem Service scheme

Analysis of the studies done on seagrass in the bay showed these ecosystems capture and store large quantities of carbon with the potential to mitigating climate change (Githaiga et al., 2017; Hejnowicz, et al., 2015). During the focus discussions, community members also mentioned the role of seagrass in carbon sequestration and indicated that they are currently consulting to have seagrasses included into mangrove PES project. At present, there are no existing PES projects in the world involving seagrasses. However, **Mikoko Pamoja** is seeking to expand its carbon offset project to include seagrasses. By setting aside only 10% of seagrass in Gazi bay for carbon offset scheme would abate emissions of 2,725 Mg CO_2e yr^{-1} and generate additional income of about 27,250/year; plus other co-benefits such as fishery functions and shoreline protection. Additional income generated from sale of seagrass carbon credits would be directed to seagrass conservation and support of priority community project (such as facilities and welfare for local fishers).

3.2.4. Integrated mariculture

Integrated mariculture especially seaweed farming was identified as another potential livelihood activity in Gazi bay. Seaweed farming has been incorporated into many community-based coastal resources management projects and fisheries management initiatives as an alternative livelihood option for fishers in developing countries. When practiced well, seaweed aquaculture has the potential to be economically viable and environmentally friendly. Processed seaweed products enter the global market where they are used as thickening agents in industrial food products and cosmetics. Interest is also emerging for use of seaweed in sustainable animal feed, biofuels, and pharmaceuticals. Gazi community have been engaged in seaweed farming in the past and there is opportunity to expand and include more farmers. During the focus groups, communities indicated their desire to engage is seaweed farming.

4.0 CONCLUSION AND RECOMMENDATION

4.1. Need to increase awareness on seagrass ecosystem services

There is need to enhance awareness at all levels on the values of seagrass ecosystems and the need to protect them for community, climate and biodiversity benefits. When communities understand the values as they carry out their livelihood options, they will strive to ensure sustainable use of seagrass resources.

4.2. Promote nature-based enterprises in seagrass areas.

After identifying potential nature based enterprises, communities can be trained and capacitated on ways to develop and implement appropriate ones in seagrass ecosystems. This would increase human-seagrass interactions; at the same time enhance food security through marine conservations. Further research on seagrass meadows should be promoted to open up livelihood options among various coastal communities. This will help in filling the information gap on seagrass ecosystems at local and national levels; and ensure that identified livelihood option is sustainable.

4.3. Marine Spatial Planning

We need to develop tools that will promote sustainable use of ocean space. One important tool is marine spatial planning that will allow integrated use of seascape. The government has initiated development of marine spatial plans (MSP) for Kenya as part of integrated coastal zone management program.

5.1. Restoration of degraded seagrass areas.

As discussed above seagrasses are among the most endangered natural capital on earth. Loss of seagrasses and the associated biodiversity compromise the integrity and the productivity of the system. Restoration of degraded seagrass areas can be used as a tool to recover the lost seagrass areas for increased food security and biodiversity conservation. Restoration of coastal and marine ecosystem is one of priority actions for the UN's Decade for Ecosystem Restorations as well as the Decade for Ocean Science (2020 -2030).

6.0 CONCLUSION

Seagrass ecosystems provide significant nature-based solutions for climate change mitigations and adaptations. They are, however, threatened globally partly due to lack of recognition of their potential contributions to people. Promoting sustainable livelihood opportunities in seagrass meadows is identified as one mechanism through which human-seagrass interaction can be enhanced for societal, biodiversity and climate benefits. Potential nature based enterprises that can be promoted in the seagrass areas of Gazi include; ecotourism, development of carbon offset projects involving seagrasses, integrated mariculture in seagrass areas, and small scale fisheries. Relevant agencies should work to ensure inclusion of all stakeholders in promoting livelihood opportunities in seagrass areas at the same time develop strategies to minimize resource use conflicts. Policy makers may look into providing incentives to communities and also ensuring technical training to enhance establishment of sustainable projects.

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