



A biodiversity rich seagrass ecosystem at Gazi bay, Kenya (photo @ Derrick Omollo)

Bundling Marine Ecosystem Services:

Inclusions of Seagrass Ecosystems into Voluntary Carbon Market

Key Highlights

- Seagrass beds are extraordinary ecosystems. Together with providing critical habits for fish and other wildlife, they capture and store huge stocks of carbon.
- Unfortunately, over the last four decades the [rate of seagrass loss in Kenya](#) increased from 0.85% to 1.59% per year.
- Losses and degradation of seagrass compromise the ecosystem integrity and their ability to continue providing ecosystem goods and services, hence the need for their conservation.
- Setting aside only 10% of seagrass in Gazi bay for carbon offset would abate emissions of 2,725 MgCO₂e yr⁻¹.
- Assuming an offset price of US\$10/tCO₂, the estimated cost of avoided loss and degradation of 10% of seagrasses in Gazi bay is US\$ 27,250/year; plus other co-benefits such as fishery functions and shoreline protection.

Pioneering work on conservation of blue carbon ecosystems

Kenya Marine and Fisheries Research Institute (KMFRI) launched and ran Mikoko Pamoja, the first community type project to restore and protect mangrove forests through sale of carbon credits in the voluntary carbon market. [Mikoko Pamoja](#) is verified by Plan Vivo systems and standards to trade 3000tCO₂-eq/yr. in the voluntary carbon market for a crediting period of 20 years (since 2013). Annual income (of ca. US\$24000) generated from sale of carbon credits is used to support local development projects in water and sanitation, education, health and mangrove conservation. Total mangrove area protected through Mikoko Pamoja is 117ha out of the 710 ha of mangroves found in the bay.

Backed by Leonardo DiCarpro Foundation and UNEP/GEF's Blue Forest Project; and with technical support from Edinburgh Napier University, KMFRI is upscaling Mikoko Pamoja activities to other mangrove areas in Western Indian Ocean (WIO) region as well as **expanding into seagrass beds**. One of such projects is [Vanga Blue Forest](#) (VBF) that was launched in 2019. The project is based in Vanga bay, located some 70km south of Gazi; and aims to restore and protect 460ha of mangroves in the area. VBF is abating emissions of 5500tCO₂e/yr. and thus generating an income of about US\$ 48,713/yr. to the community.

Seagrasses of Gazi Bay

Seagrasses are marine flowering plants that grow in the shallow intertidal and sub tidal environments. They form extensive beds whose [ecosystems services underpin human well-being](#). Like other blue carbon ecosystems they serve as habitat for fish and other fauna, protect shoreline, stabilize sediments, and [mitigate climate change through capture and storage of atmospheric CO₂](#).

There are 12 species of seagrass species in Gazi bay occupying an ocean space of approximately 960ha. These species display horizontal zonation pattern such that *Halodule uninervis*, *Halodule wrightii* and *Halophila ovalis* occupies the higher intertidal areas. This is followed by *Thalassia hemprichii*, *Cymodocea rotundata*, *Cymodocea serulata*, and *Halophila stipulacea* in the middle zone, and *Thalassodendron ciliatum*, *Enhalus acoroides* and *Syringodium ciliatum* in the deeper sub tidal areas (Fig1).

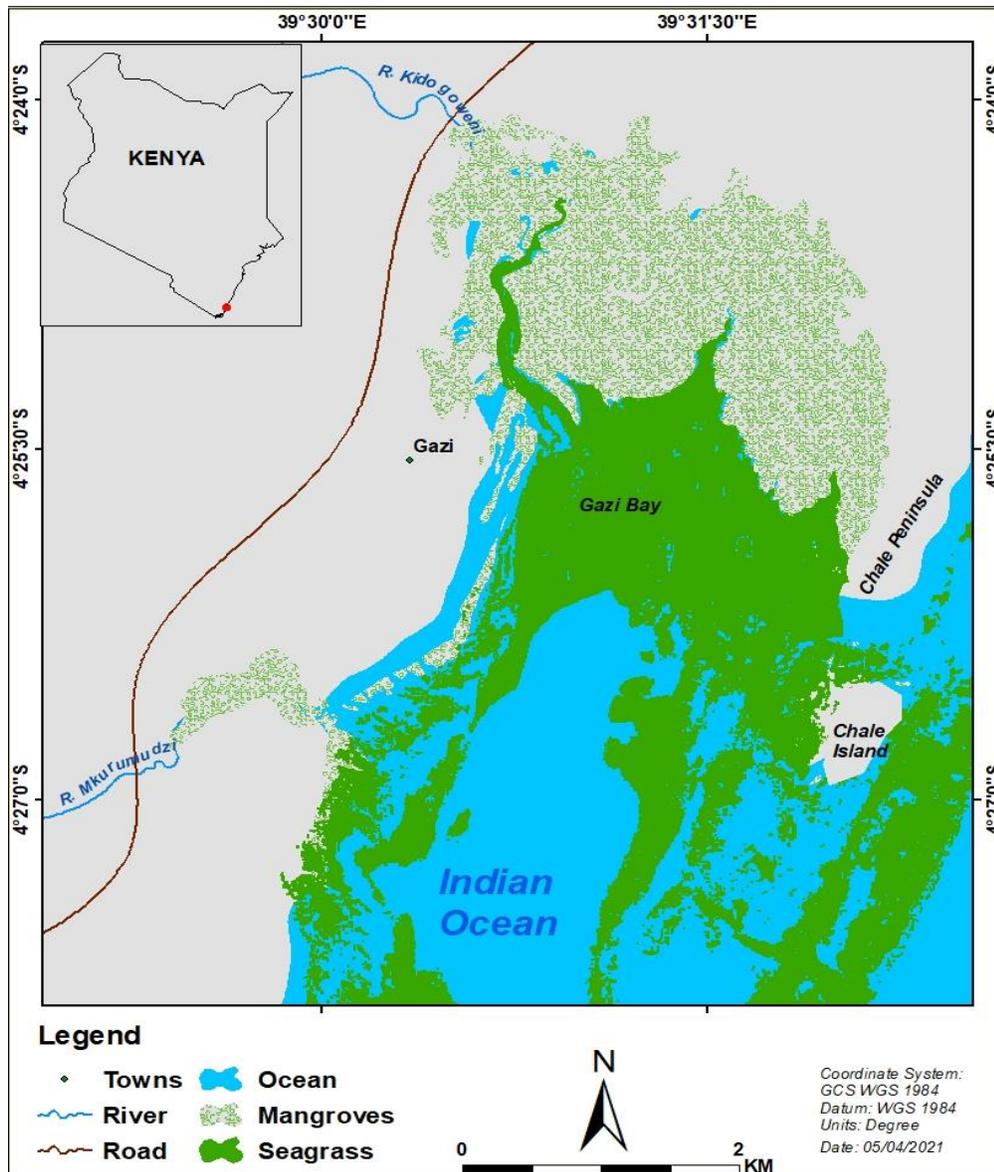


Figure 1: Distribution of seagrass in Gazi Bay

In Gazi bay, seagrass ecosystem supports a rich variety of fish and other faunal species. Fishing activities are concentrated in the intertidal areas of the bay with seagrasses. Major [species caught in seagrass](#) environment in Gazi are *Leptoscarus vaigiensis* (Pono), *Scarus ghobban* (Pono), *Lutjanus fulviflamma*, (Tembo) *Lethrinus lentjan*, (Changu) *Lethrinus nebulosus* (Changu), *Plotosus lineatus* (Ngogo) *Siganus sutor* (Tafi) and *Parupeneus barberinus* (Mikundaji). Other livelihood activities carried out within the mangroves of Gazi include seaweed farming and ecotourism.

Despite important role played by seagrasses they continue to be lost and degraded around the world as a result of poor fishing practices, habitat conversion, pollution, and climate change. For instance, over the last four decades the [rate of seagrass loss in Kenya](#) increased from 0.85% to 1.59% per year. Such losses are likely to compromise the ecosystem integrity and their ability to continue providing ecosystem goods and services, hence the need for their conservation.

Seagrasses and climate change

There have been increased interests on the potential role of seagrass beds in carbon capture and storage. Seagrasses are known to [sequester 3 to 4 times more](#) carbon than the terrestrial forests. [Paucity of information](#) exists on carbon stocks and sequestration potential of seagrass beds in Africa. Without broad information, the contribution of seagrasses in climate regulation remains inconclusive. Pioneering work on seagrass carbon assessments was carried out in the [intertidal areas](#) and [mangrove fringed creeks](#) of Gazi bay. Additional work has been carried on the sub tidal seagrasses in the bay. Based on these studies, [carbon density in seagrass beds in Gazi](#) was found to be [within the global range](#). IPCC and other studies provide a range of possible fates of 'near-surface carbon' upon conversion from 25% to 100% emissions to the atmosphere depending on land use types. Using the low end of 25% emissions, potential carbon loss from seagrasses in Gazi bay is estimated at 9,216 Mg C ha⁻¹, equivalent to 33,822.72Mg CO₂e yr⁻¹.

Marketing seagrass grass ecosystem services

Mikoko Pamoja is seeking to incorporate seagrasses into its carbon-offset scheme. Such bundling of marine ecosystem services will ensure a seascape approach to the management of Gazi bay. Including seagrass carbon in Mikoko Pamoja would provide climate, community, and biodiversity benefits. For instance, setting aside only 10% of seagrass in the bay for carbon offset would abate emissions of 2,725 Mg CO₂e yr⁻¹. Assuming an offset price of US\$10/tCO₂, the estimated cost of avoided loss and degradation of 10% of seagrasses in Gazi bay is US\$ 27,250/year; plus other co-benefits such as fishery functions and shoreline protection. Additional income generated from sale of seagrass carbon will be directed to seagrass conservation and support of priority community project (such as facilities and welfare for local fishers).

Community sensitization workshops

In anticipating seagrass inclusion in the existing carbon offset framework, community consultations have been going on to assess their readiness for the scheme. These consultations led by KMFRI have aimed at creating awareness of seagrass ecosystem services, threats facing them, and how they could be incorporated into the existing carbon offset scheme. There are plans to continue with the discussions in 2021/22 periods. This will be followed by the revision of benefit sharing scheme of Mikoko Pamoja and re-evaluation by an independent verifier.

There are protocols and guidelines that can be used to develop a seagrass carbon project. [Procedures for assessing, carbon stocks in seagrasses](#) and associated ecosystems are clearly elaborated. These methodologies are further enhanced by "[Guidelines for national greenhouse gas inventories for wetlands](#)" and [Wetlands Restoration and Conservation \(WRC\)](#), which is a framework for accounting emissions reductions in mangroves, seagrasses and their associated ecosystems. [A blue carbon primer](#) provides a one top-shop of developing and implementing a blue carbon project. These documents can be consulted when planning to develop and implement a blue carbon project.

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