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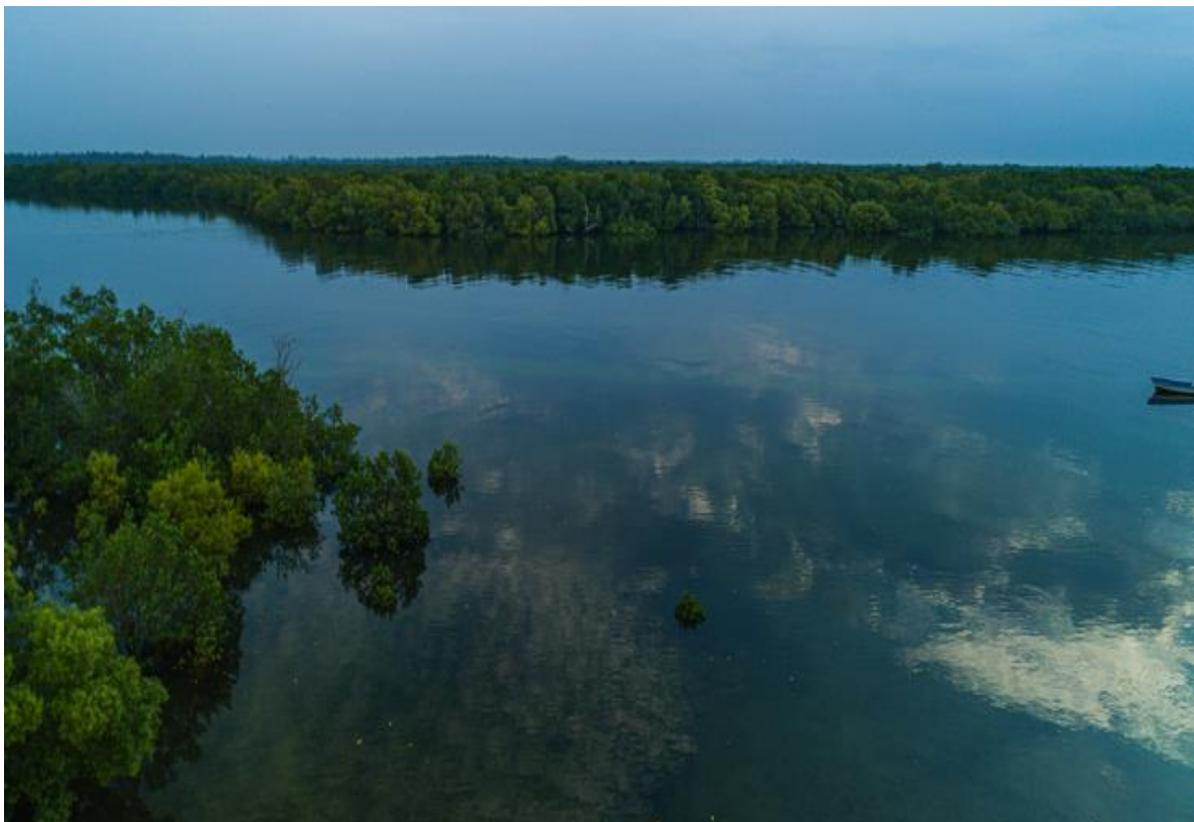
Blue Carbon in Updated Kenya's Nationally Determined Contributions

April 2021

Acknowledgement

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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.

Project website: www.gefblueforests.org

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OCEAN CLIMATE SOLUTIONS:

Blue Carbon in updated Kenya's Nationally Determined Contributions

Technical Report

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Acronyms

ATAR	Adaptation Technical Analysis Report
BC	Blue Carbon
C	Carbon
CCD	Climate Change Directorate
CoK	Constitution of Kenya
COP	Conference of Parties
GHG	Greenhouse Gas
GoK	Government of Kenya
IPCC	Intergovernmental Panel on Climate Change
KFS	Kenya Forest Service
LULUCF	Land use, and Land-use change and Forestry
MoEF	Ministry of Environment and Forestry
MTAR	Mitigation Technical Analysis Report
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NDCs	Nationally Determined Contributions
OCS	Ocean-based climate solutions
PA	Paris Agreement
UNFCC	United Nations Framework Convention on Climate Change

Glossary

Blue carbon: Carbon found in three major coastal and marine ecosystems: mangroves, seagrasses and salt marshes.

Nationally Determined Contributions: efforts by each country to reduce national emissions and adapt to the impacts of climate change

Business-as-usual (BAU) scenario: a plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces and relationships.

Carbon stock: the amount of carbon contained in a reservoir or system that has the capacity to accumulate or release it

Nature-based Climate Solutions: actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits

Ocean Climate Solutions: Action to reduce greenhouse gas emissions and limit further temperature rise.

1.0   Introduction

Increased human population and drive for economic development have resulted in loss and degradation of natural capital; and increased greenhouse gas (GHG) emissions leading to global warming. This has adversely impaired the resilience of natural ecosystems and their ability to sequester carbon. While these effects are being experienced around the world, governments, multilateral organizations, civil society, policy makers, private sector, scientists, and conservation practitioners among others are actively engaged in exploring best approaches to reduce emissions and vulnerability of ecosystems and people to climate change.

Under the Paris Agreement, parties to the United Nations Framework Convention on Climate Change (UNFCCC) have made commitments to 'limit global warming, to well, below 2^oC preferably to 1.5^oC, compared to pre-industrial levels'[1]. The commitments are in the form of Nationally Determined Contributions (NDCs) and are submitted every five years, starting 2015. Each party submits its NDCs outlining what they are willing to do in transitioning to low carbon development pathways and a climate resilient future. The parties also report on the progress made, and support needed towards achieving their commitments.

Intervention measures that ensure protection, sustainable management, restoration and reduction in loss and degradation of natural capital are seen as having the greatest potential of mitigating as well as providing adaptation benefits against the adverse effects of climate change. Nature-based climate solutions have been proposed to have the potential to capture and store significant amounts of carbon (C), thereby reducing the atmospheric C concentrations (Griscom et al., 2020). The contributions of terrestrial ecosystems in climate change mitigation and adaptation actions are well known. However, oceanic climate actions have largely been overlooked or poorly understood, despite accounting for 55% of uptake of the atmospheric C (Nellemann et al., 2009; Howard et al., 2017).

The climate debate has seen an upsurge in interest on ocean-based climate solutions (OCS); with a lot of focus on blue carbon ecosystems (BC) such as mangroves, salt marshes and seagrass beds (Nellemann et al., 2009; McLeod et al., 2011). Although they occupy less than 0.05% of the sea bed, BCs account for 50-71% of the entire C stored in the ocean sediments are ranked among the most intense C sinks on the planet (Nellemann et al., 2009; Donato et al., 2011). Unfortunately, BC are degrading globally at an alarming rate of 1-7% per year for mangroves and 7% per year for seagrass beds since 1990. This is significantly higher than the global loss of tropical forests, estimated at 0.5% per year (FAO, 2007; Waycott et al., 2009). When BC are degraded, they not only reduce the uptake of carbon, but also release the already stored carbon back to the atmosphere exacerbating global warming (Pendleton et al., 2012). Restoration and protection of BC has been recognized as a priority for climate change mitigation and adaptation; and several countries have identified measures that harness these benefits in their NDCs[2].

Kenya submitted her first NDC on 28th December 2016 to the UNFCCC committing to a 30% abatement in GHG emissions by 2030, relative to a business-as-usual (BAU) scenario of 143 MtCO$_2$e annually (GoK, 2016). The NDC identified mitigation options as well as key sector vulnerability and adaptation issues

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[1] UNFCCC, 2015

[2] INDC Portal <http://www4.unfccc.int/submissions/indc/Submission%20Pages/ submissions.aspx>

for agriculture, water, energy, health, and the social-economic context. Under the forestry sector, the establishment of forest cover of at least 10% was identified as a climate change mitigation measure. Despite their high carbon sequestration rates and the multiple ecosystem services they provide, blue carbon ecosystems (comprising mainly the mangroves and seagrass beds) were not integrated in Kenya's first NDC. In addition, the baseline values adopted for emissions and projections in Kenya's first NDC were adopted from the FAO (2010) country emissions and projections (FAO, 2010; GoK, 2015), which did not include contributions of vegetated coastal wetlands such as mangrove forests and the seagrass beds due to lack of information.

The main barriers to the integration of BC into Kenya's NDC have been; inadequacy of robust and systematized information on carbon stocks, emissions and value of these critical ecosystems. Further, the poor understanding of their intrinsic and economic value undermines the development of strategies for minimizing trade-offs between climate, conservation and coastal development goals.

The overall objective of the current project was to facilitate the incorporation of BC and other ocean climate actions into the updated Kenya's NDCs. More specifically, the objectives were:

i)   Review major policy documents and legislations in Kenya for inclusion of ocean actions in climate change mitigation and adaptations
ii) Estimate emission levels and trends from BC ecosystems
iii) Collaborate with the NDC task force to incorporate BC into the revised NDCs

2.0   POLICY AND LEGAL ANALYSIS

Kenya's ambition to be a newly industrialised middle economic country by 2030 has a risk of being adversely affected by climate change since its economic and social development is sensitive to climate variability. Recognizing this fact, Kenya embarked on a mission of combating climate change through providing the enabling environment in policy, legislative and institutional frameworks to be adopted for a low carbon development pathway.

The Constitution of Kenya (CoK, 2010) provides the overarching framework for climate actions. The Constitution gives rights to every Kenyan to enjoy a clean and healthy environment. It lays the basis upon which other climate related policies and instruments derive their mandate. The Constitution specifically prescribes a minimum of 10% tree cover for the country and elimination of any processes likely to endanger the environment. Other policy and legislative frameworks and strategic plans include National Climate Change Framework (2016), Climate Change Act (2016), National Climate Change Response Strategy (NCCRS 2010), National Adaptation Plan (NAP) 2015-2030, National Climate Change Action Plan (NCCAP) 2018-2022, among others. The NCCAP has been developed together with adaptation and mitigation technical analysis reports (NCCAP Vol III: Mitigation Technical Analysis Report – MTAR and NCCAP Vol II: Adaptation Technical Analysis Report – ATAR). These policies and plans are operationalized through the implementation of sectoral plans and programs across the six main sectors identified in IPCC's guidelines for national greenhouse gas accounting (IPCC, 2006): Agriculture, Energy, Industry, Land use, and Land-use change and Forestry (LULUCF), Transport, and Waste. Though the LULUCF sector includes wetlands, the national greenhouse gas inventory reporting for this sector does not include emissions from the BC. Therefore, the objective of this review was to identify how ocean climate actions could be mainstreamed into national and sectoral plans and programs through which the NDCs are achieved.

We reviewed a total of fifteen (15) policy documents, legislations, and sectoral plans in order to identify opportunities and gaps for inclusion of ocean climate solutions in the Updated NDCs. The reviewed documents provide enabling frameworks and opportunities within which ocean climate actions could be mainstreamed into Kenya's climate action and development programs at both national and county governments, as well as in the private sector. However, fundamental gaps regarding ocean climate actions were identified mainly due to the paucity of information regarding the ocean sector (Table 1). Most policy issues emphasise the sectors in terrestrial settings and hence strategies and plans developed are leaning towards these sectors.

Building on these enabling frameworks and addressing the gaps highlighted provides an opportunity for full integration of ocean climate actions into Kenya's sector-wide climate actions and subsequently into its progressive NDCs. The gaps identified and recommendations suggested are summarized in Table 1.

Table 1: Key environmental policies and legislations reviewed and summary of gaps and recommendations

Policy and Legislations	Gaps	Recommendations
i) Constitution of Kenya, 2010 ii) National Climate Change Framework Policy iii) Climate Finance Policy iv) Integrated Coastal Zone Management Policy, 2013 v) Climate Change Act 2016 vi) Forest Conservation and Management Act 2016 vii) Wildlife Conservation and Management Act 2013 viii) Fisheries Management and Development Act	i) The role of the ocean sector in climate change interventions is not adequately highlighted. ii) Risks and vulnerability of climate change on coastal and marine sector not well captured iii) Benefits of blue carbon ecosystems to climate, livelihood support, and biodiversity conservation not adequately highlighted, iv) Contributions of coastal wetlands have not been captured in the GHG inventory reporting and thus	i) Review and provide updates on the status and conditions of BCEs, including climate change risks and vulnerability and the valuation of their ecosystems services to provide enabling actions: a. To document, raise awareness and communicate on their importance to climate benefits, biodiversity conservation, coastal development and livelihood support, and the consequences of their loss and degradation b. To develop blue carbon policy recommendations to be incorporated and mainstreamed into climate change policies, response strategies and plans, as well as development programs and plans at national level and relevant county governments.

National and Sectoral Plans

ix) National Climate Change Action Plan, 2018-2022
x) National Adaptation Plan, 2015-2030
xi) National Climate Change Response Strategy, 2010
xii) National Strategy for Achieving and Maintaining Over 10% tree Cover By 2022
xiii) Taskforce Report on Forest Resources Management and Logging Activities in Kenya, 2018)
xiv) National mangrove management plan, 2017 – 2027.

subsequently not included in the emissions projections.

v) More emphasis is laid on the sectors in terrestrial settings and hence strategies and plans developed give more attention to priority actions in these sectors, e.g. Kenya Climate Smart Agriculture (CSA) and the System for Land-based Emission Estimation (SLEEK). But Policy issues and strategies specific to coastal and marine systems have not been adequately captured.

c. To update on BCEEs status with regard to Marine Protected Areas (MPAs) and whether there is need to establish more or expand existing MPAs
d. To develop coastal and marine ecosystems specific plans and strategies, e.g. marine spatial plan, and seagrass strategic action plans,
e. To develop consistent data collection and development of databases on the status BCEEs.
f. To include valuation of coastal ecosystem services into national natural capital accounting system
g. To inform trade-offs in development programs and shift to a sustainable ocean economy.
h. To develop frameworks and strategies for participatory and collaborative management of coastal and marine ecosystems e.g. co-management, locally managed marine areas (LMMAs) and engaging the private sector

ii) Review and provide updates on the status and conditions of blue carbon ecosystems; particularly, valuation of their ecosystems services to enable their integration to policy framework and national and county level development plans
iii) Conduct vulnerability assessment of climate change of blue carbon ecosystems and develop their mitigation actions
iv) Quantify the contribution of BCE to emission reduction in order to include them in national GHG inventory reporting.
v) Develop strategies for designing and tracking programs for ocean climate actions and integrating them into MRV (measurement, reporting, and verification) framework

vi) Identify and develop ocean nature-based climate solutions to leverage on the established enabling aspects of climate finance mechanisms.

vii) Develop strategies for the implementation of the National Mangrove Ecosystem Management Plan

viii) Develop strategies and mechanisms to enhance access to the national and international climate fund opportunities for climate-proofing investments to increase opportunities for small and medium enterprises in the BCEEs.

ix) Identify priority actions that link the energy sector with BCEEs especially in the protection of BCEEs (e.g. mangroves for wood fuel) by providing alternatives for fuel.

3.0   CARBON STOCKS, EMISSIONS AND TRENDS OF BLUE CARBON ECOSYSTEMS IN KENYA

In Kenya, BC is mostly represented by mangrove and seagrass beds, which are very crucial for the well-being of coastal communities and environmental integrity. However, these systems are being lost and degraded due to combinations of anthropogenic and natural factors (Table 2). In order to incorporate BC into strategic and sectoral programs, there is a need to determine their extent, carbon stocks and emission levels. The purpose of this work, therefore, was to carry out cover and cover change analysis and estimate carbon stocks and emission levels for the BC in Kenya.

We reviewed existing data and information on blue carbon ecosystem cover and cover change, carbon stocks, sequestration rates and emission levels through literature search. A total of 19 mangroves and 11 seagrass publications were reviewed and analysed. The derived cover and cover changes were then used in estimations of carbon stocks and emission levels. Where data was not available, default values provided by IPCC (2013) were used together with the available country activity data to estimate carbon stocks, gains-losses and emissions levels.

3.1   Status and Conditions of BC ecosystems in Kenya

Most studies on blue carbon ecosystems in Kenya are site (Bosire et al., 2014; Kairo et al., 2002) or county specific (Mungai et al., 2019; Kairo et al., 2021). Kirui et al. (2013) analysed country wide mangrove cover and cover change estimating mangrove cover loss of 9,690 ha between 1985 and 2010 with annual rate of 0.7%. This trend has declined as compared to the current cover change analysis results (Figure 1), which show an overall annual loss of about 0.5%. Table 3 gives an overview of cover and cover loss for specific sites in the country that have been studied with the highest loss recorded in peri-urban mangroves of Mombasa that recorded annual decline of 3.8%. The mangrove cover estimates, 54,661 ha, reported here are higher than those of Kirui et al (2013) 45,590 ha, which could be due to methodological differences.

Compared to mangroves, studies on seagrass cover and cover change are more limited. To our knowledge, only (Harcourt et al., 2018) has reported spatial extent seagrasses along the Kenya coast and their temporal changes. Harcourt et al. (2018) estimated seagrass cover at 31,710 ha with a loss of 11,763 ha between 1986-2016, which translated to an annual loss of 0.9% by area per year. The hotspot for seagrass loss and degradation is Lamu; a factor associated with poor fishing activities among other factors (Figure 2).

Table 2: Threats and drivers of change of Blue Carbon ecosystem in Kenya

Ecosystem	Threats			Drivers of change and/or loss
	Anthropogenic factors	*Climate change related factors*	*Natural factors*	
Mangroves	i) Overharvesting ii) Clearing and Conversion iii) Waste and Pollution iv) River flow changes and Sedimentation v) Coastal development	i) Sea-level rise ii) Excessive flooding iii) Increased sedimentation	i) El Nino phenomena ii) Coastal erosion iii) Pests and diseases	i) Rapid population growth ii) Subsistence dependence on blue carbon resources iii) Economic growth, coastal urbanization and development iv) Governance and institutional challenges v) Inadequate law enforcement vi) Uncoordinated sectoral approach to management vii) Lack of effective coastal planning viii) Lack of proper community and stakeholder involvement ix) Inadequate knowledge and awareness on coastal and marine ecosystem services x) Climate change
Seagrass meadows	i) Eutrophication ii) Unregulated fishing iii) Poor fishing methods? iii) Dredging iv) Agricultural run-off v) Sedimentation vi) Pollution vii) Vegetation clearance and damage for development e.g. for tourism, transport	i) Sea level rise ii)Temperature increase iii) Ocean acidification	i) Coastal erosion ii) Overgrazing by marine fauna, e.g. sea urchin	

Table 3: Cover and cover change of BC in Kenya

Ecosystem	Block	Base year	Base year cover (ha)	Latest year reference	Latest reference year cover (ha)	Cover change (ha)	Rate (%/year)	Source
Mangrove	Country	1985	55,280	2010	45,590	9690	0.7	Kirui et al 2013
	Kwale	1986	7,399	2018	6,195	1204	0.6	Mungai et al 2019
	Kilifi (Watamu & Mida)	1969	2,291.3	2010	2,083	208.3	0.3	Alemayehu et al 2014
	Kilifi (Kilifi & Mida)	1990	2,134	2015	2,083	51	0.1	Ibrahim et al 2017
	Mombasa	1992	3,504.5	2009	1,234	2,270.5	3.8	Bosire et al 2014
	Lamu	1990	37,417	2020	35,678	1,739	0.9	**This study**
	Country	1990	63,168	2020	54,661	8,507	0.5	**This study**
Seagrass	Kwale (Gazi bay)	1987	27	2016	15	12	0.04	Mohamed 2018
	Country	1986	42,600.6	2016	31,710.1	10,889.91	0.9	Harcourt et al 2018
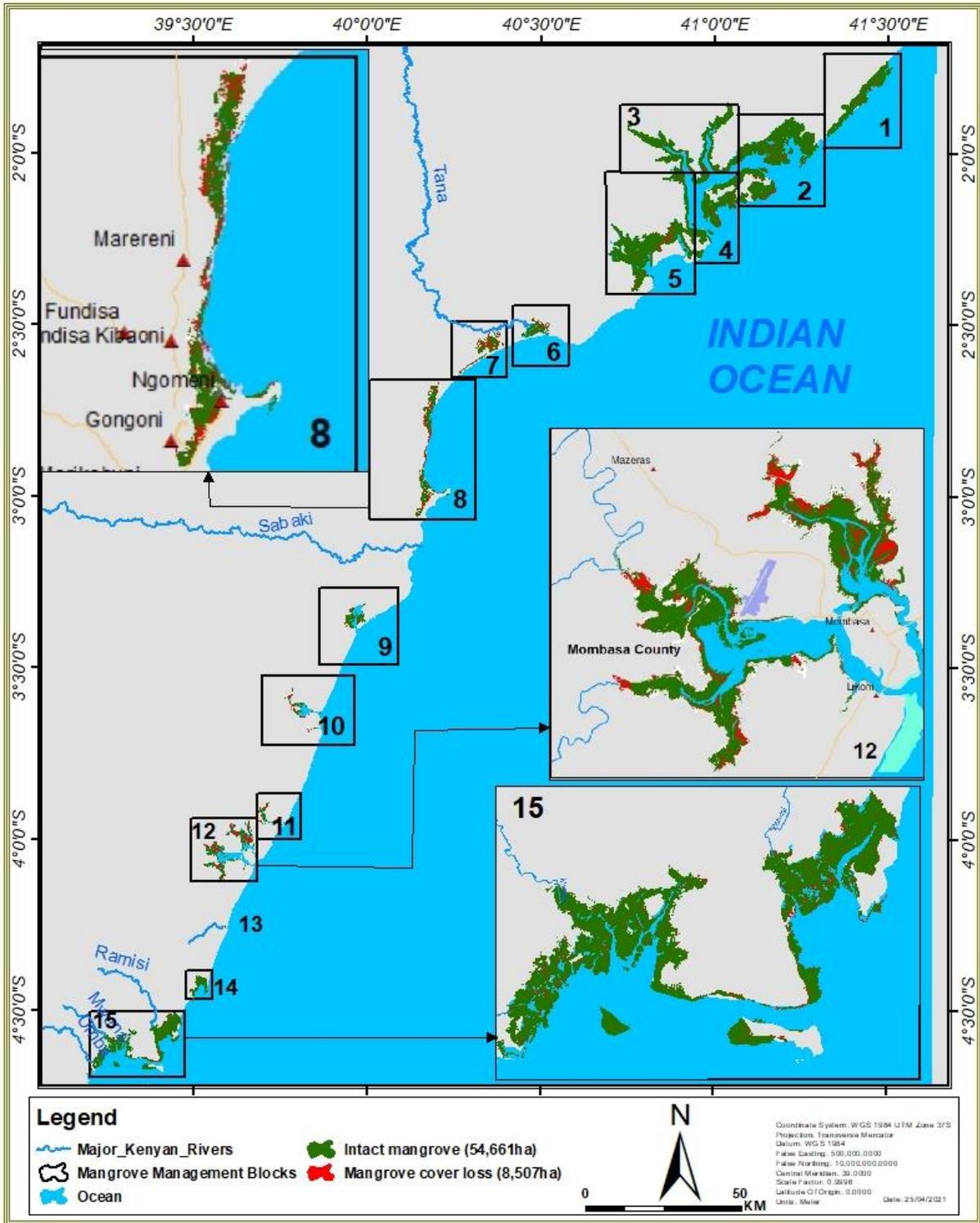
Figure 1: Kenya mangrove change from 1990-2020

Numbers represent the management blocks/map units used by Kenya Forest Service (KFS); 1 (Northern Swamps); 2 (North Central Swamps); 3 (Mongoni-Dodori Creeks Swamp); 4 (Pate Island Swamps); 5 (Southern Swamps); 6 (Kipini),7 (Mto Tana); 8 (Ngomeni); 9 (Mida); 10 (Kilifi Creek); 11 (Mtwapa); 12 (Mombasa); 13 (Ukunda); 14 (Gazi); 15 (Vanga-Funzi) mangrove systems.
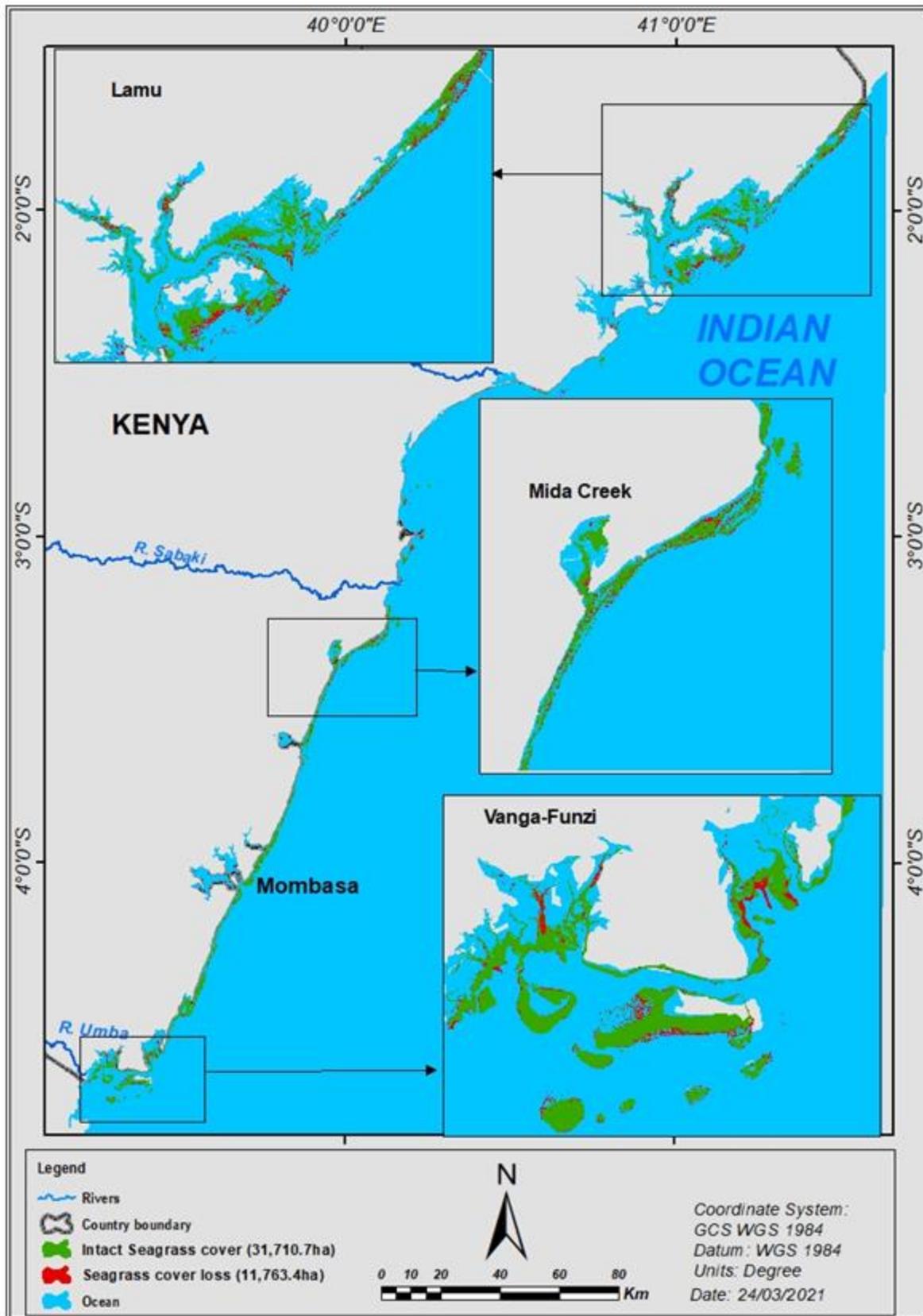
Figure 2: Kenya seagrass cover change 1986-2016

3.2 Carbon Stocks, Emission Levels and trends

Information on carbon stocks and emissions of BC in various sites in Kenya is shown in Table 4. Vegetation carbon stocks of mangroves ranged 55.03 to 166.57 tC/ha while the soil carbon stocks to 1.0 m depth ranged between 246.10 to 524.10 tC/ha. Based on these values, the total mangrove ecosystem carbon stocks in Kenya are 25.33 MtC (Table 5); equivalent to 92.88 MtCO$_2$. Data on carbon emissions from mangrove ecosystems is restricted to an experimental study at Gazi bay, which indicates that small-scale cutting in mangroves could lead to C emissions of 25.3 tCO$_2$/ha/yr (Lang'at et al., 2014). These values are higher than the global mean values of 8.3tCO$_2$e/ha/yr (Siikamaki et al., 2012), but compare well with mangrove ecosystems that have been subjected to disturbance; 29 tCO$_2$ for large scale clear-cutting (Lovelock et al., 2011) and 15 tCO$_2$e/ha/y for hurricane-damaged ecosystems (Cahoon et al., 2003). Since overharvesting of wood products is a major threat of mangrove forests in Kenya (Abuodha and Kairo, 2001), we calculated the country level potential carbon emissions due to anthropogenic activities at 1.3 MtCO$_2$/yr, using the values reported for Gazi bay.

To our knowledge, there are only two published studies on seagrass carbon in Kenya (Githaiga et al., 2017 and Juma et al., 2020) and one unpublished report (Omolo et al., unpublished). All these studies were based in Gazi bay, and reported seagrass vegetation carbon ranging from 5.6 to 7.25 tC/ha and soil organic carbon from 182.5 to 235.57 tC/ha (Table 4). Taking the mean of these values gives the total ecosystem carbon stocks of seagrass beds in Kenya as 7.0 MtC. Which is equivalent to 25.69 MtCO$_2$. From the cover loss data, carbon emission for seagrass was calculated as 0.18 tCO$_2$e/ha/yr, which is lower than the global value of 1.22tCO$_2$e/ha/yr (Bedulli et al., 2020).

From our estimates, the total ecosystem carbon stocks for the mangrove and seagrass ecosystems in Kenya are 22.33 MtC (or 9288 MtCO$_2$e) and 7.0 (or MtC 25.69 MtCO$_2$e), respectively. Taking a conservative scenario that 25% of C is at risk of being released when the system is disturbed, the potential C at risk of emissions from the mangroves and seagrass ecosystems of Kenya are 23.22 MtCO$_2$e/yr, and 6.42 MtCO$_2$e/yr, which, when combined are higher than the projected emissions of 22 MtO$_2$e/yr by the land-use and land-use and forestry (LULCF) sector by 2030 (GoK 2015). This underscores the need to incorporate the BC ecosystems in national GHG reporting as well as making concerted efforts for their conservation.

3.3 Economics of BC in NDCs

We used the estimates of the potential CO$_2$ emissions to calculate the cost of avoided CO$_2$ emissions of sustainable production, protection and conservation of BC ecosystems. Taking a carbon price of US$ 10/tCO2e, the cost of avoided cost of CO$_2$e emissions is US$ 232.2 million and US$ 64.2 million for the mangrove and seagrass beds, respectively.

In a typical blue carbon project, the economic model would include for example the benefits of avoided emissions as well as those of sustained sequestration. The start-up costs as well as those of protection of BCs should also be taken into account. The economic potential of avoided emissions in mangroves is mostly determined by, opportunity cost of land in a particular location, possibility of future habitat loss and initial and operational costs of protected areas (Siikamaki et al., 2012). For the seagrass ecosystems, the avoided emission is mostly through reducing human anthropogenic pressure on these systems (Siikamaki et al., 2012). Thus, effectiveness of blue carbon in emission reduction will

depend on their ability to make a return on investment including initial start-up as well as recurring expenses for example protection costs (Siikamäki et al., 2012). Mangrove conservation projects with a focus on sale of carbon credits also achieve other ecosystem co-benefits including biodiversity conservation (Twilley et al., 1996; Siikamaki et al., 2012). However, mangrove carbon projects that also purposely focus on biodiversity protection offer even greater benefits (Siikamaki et al., 2012). That notwithstanding, blue carbon projects whose benefits from sale of carbon credits can cover all costs including those of protection are considered effective and sustainable even without including the benefits from other ecosystem services (Murray et al., 2011).

Approximately 38% (23,350 ha) of mangrove areas in Kenya are degraded, thereby requiring protection and rehabilitation (GoK, 2017). The rehabilitation and protection of these areas would yield avoided emissions of 590,755 tCO_2e/yr, assuming a carbon price of USD 10/tCO_2e, this is equivalent to USD 59.08 million gross benefits by 2030. Under the business as usual (BAU) scenario, 0.6% of mangrove areas is lost every year, which will translate to a loss of 3,123 ha by 2030. This will lead to emissions of 79,015 tCO_2e, equivalent to USD 790,150. Assuming no action is taken to protect and rehabilitate the degraded areas, the total cost of carbon emissions is USD 59.87 million by 2030. However, taking a conservative intervention scenario of protecting and rehabilitating 25% of degraded areas and reducing cover loss by 25%, the avoided cost of carbon emissions is equivalent to USD 13.97 million.

Table 4: Carbon stocks and emissions of BCEs in various sites in Kenya

Ecosystem	Level/Site	Vegetation (tC/ha			Soil tC/ha	Total (tC/ha)	Emissions (tCO$_2$/ha/yr)	Source
		Aboveground	*Belowground*	*Total*				
Mangrove	Lamu	127.85	38.72	166.57	393.66	560.23		Kairo et al 2021
	Mombasa (Mwache)	107.50	35.200	142.700	246.10	388.80		Mugi 2015
	Kwale (Gazi)	39.61	15.42	55.0346	524.1	579.13	25.3-35.6	Lang'at et al 2014
	Kwale (Gazi)		19.15					Tamooh et al 2008
	Kwale (Gazi)				297.00			Adreetta et al., 2013
	Average	**91.65**	**27.12**	**121.43**	**365.22**	**487.67**		
Seagrass	Kwale (Gazi, Creeks)			7.25	182.5			Juma et al 2020
	Kwale (Gazi, Intertidal)			5.9	235.57			Githaiga et al 2017
	Kwale (Gazi, Subtidal)			5.6	226			Omollo et al unpublished
	Average			**6.25**	**214.69**	**220.08**		

Table 5: Carbon stocks, sequestration and emissions of BCEs in Kenya

Component		Mangroves		Seagrasses		Forestry (LULUCF)
		Kenya	Global	Kenya	Global	Kenya
Cover (Million ha)		0.052	13.92	0.0317	31.90	3.04
Cover change (%/yr)		0.60	1.9	0.85	1.5	0.43
Total carbon (tC/ha)	Vegetation	121.43	147.49	6.25	1.84	
	Soil	365.22	320	214.69	70	
	Total	486.67	467.49	220.94	71.84	
Carbon Sequestration (tC/ha /yr)		1.63	1.15	0.23	0.54	
Total carbon sequestration (Million tC /yr)		0.743	16.0	0.073	17.23	
Total ecosystem carbon stocks (Million tC)		25.33	6,506	7.00	2,281	
Potential carbon emissions due to anthropogenic activities	*CO_2 emissions (tCO_2/ha/yr)*	35.60	8.3	0.18	1.22	1.07
	Total CO_2 emissions (Million tCO_2/yr)	1.85	121.11	0.008	38.90	25

4.0 OCEAN CLIMATE SOLUTIONS IN UPDATED KENYA'S NDC

Climate Change Directorate (CCD) in the Ministry of Environment and Forestry is the agency tasked with coordinating climate actions in Kenya. CCD commissioned an NDC Task Force (hereinafter referred to as Task Force) to work closely with other stakeholders in updating Kenya's NDCs; in accordance with the Paris Agreement and guidelines of Katowice text. The sector-wide consultative framework provided an opportunity to re-look at the NDC revision process and ensure that ocean climate solutions are incorporated.

Kenya Marine and Fisheries Research Institute (KMFRI) with support from Pew Charitable Trust, The Nature Conservancy, UN's Blue Forest Project, Wetlands International, Conservation International, WWF, IUCN, and Napier Edinburgh University (UK) supported the country's ambition to incorporate ocean climate actions into the updated NDC. KMFRI organized virtual and face to face consultative meetings that provided input to the draft NDC prepared by Climate Change Directorate in the Ministry of Environment and Forestry.

On 28th December 2020, Kenya's updated NDC submitted to the UNFCCC secretariat. In the updated NDC, Kenya sets to abate her GHG emissions by 32% by 2030 relative to the BAU scenario of 143 $MtCO_2$ equivalent per annum, and in line with national development agenda. Contributions described in the updated submission built upon Kenya's initial NDCs, National Climate Change Action Plan (2018-2022), National Adaptation Plan (2015-2030), and sectoral and national plans.

Harnessing the mitigation benefits of sustainable blue economy, including blue carbon payments for ecosystem services (PES) are among ambitious ocean-based climate mitigation actions in the updated NDCs. Adaptation, however, is the highest priority for Kenya, not only through preventing further losses and damage but also mainstreaming climate change adaptations into the Medium-Term Plans and County Integrated Development Plans. Several ocean climate actions have been included in priority adaptation actions in the updated NDC (Box 1)

Box 1. Ocean based adaptation actions identified in Kenya's updated NDC (2020)

- Flood risk management incorporating nature-based solutions, including; mangrove reforestation.
- Rehabilitation and conservation of degraded forests, that include mangroves.
- Enhance governance structures in participatory resource management in coastal ecosystems.
- Conduct blue carbon readiness assessment for full integration of blue carbon/ocean climate actions into NDCs.
- Develop marine spatial planning and outline sustainable management approaches
- Promote and expand opportunities for nature-based enterprises including seaweed farming and mangrove ecotourism.
- Integrate the use of nature-based solutions, including the implementation of national mangrove management plan into national and county development plans.
- Implement national mangrove management plan

The total cost of implementing mitigation and adaptation actions of the updated NDC is estimated at USD62 billion over the next 10 years; with a stock taking expected in 2025. Compared to the first submission that was fully conditional to support, Kenya, in the revised NDCs intends to bear 13% of the implementation cost from domestic budget with the balance coming from the international support in form of finance, technology development and transfer, and capacity building.

5.0   CONCLUSION

Oceans have the potential to contribute to climate change mitigation and adaptations. Full implementations of ocean climate solutions (OCS) could deliver up to 21% of annual GHG emissions cuts required globally by 2050 to keep the temperature rise below the 1.5°C (Hoegh-Guldberg et al., 2019). In addition, embracing the approaches of sustainable ocean economy, through the new narrative of *effective protection, sustainable production and equitable prosperity*, (now referred as the three (**3Ps'** of sustainable ocean economy) yields the co-benefits of climate mitigation and adaptation (Stuchtey et al., 2020). Investing in the sustainable ocean economy has the potential of accelerating the low carbon development pathway, while providing job opportunities, enhancing food security, improving livelihoods of the coastal communities and contributing immensely to the global economy. Recent analysis suggests that investing about $1 in mangrove conservation and restoration could yield a net benefit of up to $3 resulting in total benefits of $48-150 billion by 2050; translating to a benefit-cost ratio of up to 5:1 (Konar & Ding, 2020).

Although Kenya is faced with technological and financial constraints to embrace wide-ranging opportunities for ocean climate actions, it stands to benefit much in investing in the natural climate solutions. For example, analysis on cost-effective investment in natural climate solutions indicates that by investing in mangrove conservation and restoration Kenya could abate approximately 0.3 $MtCO_2e$ with less than $100 cost per tCO_2e (Griscom et al., 2020). The incorporation of the ocean climate actions into updated NDC is a substantial milestone for Kenya in its championing of a   sustainable blue economy (Commonwealth Secretariat, 2018). Consequently, this calls for concerted efforts by actors in the ocean sector to utilize this opportunity to upscale the development of strategies for influencing ocean climate policy framework at county and national levels. Of particular importance is utilizing ocean climate solutions in harnessing benefits of associated with sustainable blue economy.

6.0   REFERENCES

Abuodha, P. A. W., & Kairo, J. G. (2001). Human-induced stresses on mangrove swamps along the Kenyan coast. Hydrobiologia, 458(1), 255-265.

Alemayehu, F., Richard, O., James, K. M., & Wasonga, O. (2014). Assessment of mangrove cover change and biomass in Mida creek, Kenya. *Open Journal of Forestry*, *2014*.

Alongi, D. M. (2002). Present state and future of the world's mangrove forests. *Environmental conservation*, 331-349.

Armitage, A. R., & Fourqurean, J. W. (2016). Carbon storage in seagrass soils: long-term nutrient history exceeds the effects of near-term nutrient enrichment. *Biogeosciences*, *13*(1), 313-321.

Bedulli, C., Lavery, P. S., Harvey, M., Duarte, C. M., & Serrano, O. (2020). Contribution of seagrass blue carbon toward carbon neutral policies in a touristic and environmentally-friendly island. *Frontiers in Marine Science*, *7*, 1.

Bosire, J. O., Kaino, J. J., Olagoke, A. O., Mwihaki, L. M., Ogendi, G. M., Kairo, J. G., Berger, U., & Macharia, D. (2014). Mangroves in peril: Unprecedented degradation rates of peri-urban mangroves in Kenya. *Biogeosciences*, *11*(10), 2623–2634. https://doi.org/10.5194/bg-11-2623-2014

Cahoon, D. R., Hensel, P., Rybczyk, J., McKee, K. L., Proffitt, C. E., & Perez, B. C. (2003). Mass tree mortality leads to mangrove peat collapse at Bay Islands, Honduras after Hurricane Mitch. Journal of ecology, 91(6), 1093-1105.

Commonwealth Secretariat (2018). Commonwealth Blue Charter. Shared Values, Shared Ocean. A Commonwealth Commitment to Work Together to Protect and Manage Our Ocean. London: Commonwealth Secretariat.

Donato DC, Kauffman JB, Murdiyarso D, Kurnianto S, Stidham M, Kanninen M (2011) Mangroves among the most carbon-rich forests in the tropics. Nat Geosci 4:293–297.

Duarte, C. M., Middelburg, J. J., & Caraco, N. (2005). Major role of marine vegetation on the oceanic carbon cycle. *Biogeosciences*, *2*(1), 1-8.

Duke, N. C., Meynecke, J. O., Dittmann, S., Ellison, A. M., Anger, K., Berger, U., ... & Dahdouh-Guebas, F. (2007). A world without mangroves? *Science*, *317*(5834), 41-42.

FAO (2007). The World's Mangroves 1980e2005 A thematic study prepared in the framework of the Global Forest Resources Assessment 2005, FAO Forestry Paper-153.

FAO (2010). Global Forests Resources Assessment 2010: Country Report Kenya.

Githaiga, M. N., Kairo, J. G., Gilpin, L., & Huxham, M. (2017). Carbon storage in the seagrass meadows of Gazi Bay, Kenya. *PloS one*, *12*(5), e0177001.

Government of Kenya (2017). *National Mangrove Ecosystem Management Plan*. Nairobi, Kenya: Kenya Forest Service.

Griscom BW, Busch J, Cook-Patton SC, Ellis PW, Funk J, Leavitt SM, Lomax G, Turner WR, Chapman M, Engelmann J, Gurwick NP, Landis E, Lawrence D, Malhi Y, Murray LS, Navarrete D, Roe S, Scull S, Smith P, Streck C, Walker WS, Worthington T (2020) National mitigation potential from natural climate solutions in the tropics. Philos Trans R Soc B Biol Sci 375.

Harcourt, W. D., Briers, R. A., & Huxham, M. (2018). The thinning green line? Investigating changes in Kenya's seagrass coverage. *Biology letters*, *14*(11), 20180227.

Hoegh-Guldberg O, Caldeira K, Chopin T, Gaines S, Haugan P, Hemer M, Howard J, Konar M, Krause-Jensen D, Linstad E, Lovelock CE, Michelin M, Nielsen FG, Northrop E, Parker R, Roy J, Smith T, Some S, Tyedmers P (2019) The Ocean as a Solution to Climate Change: Five Opportunities for Action. Report Washingt World Resour Institute Available online http//www.oceanpanel.org/climate:116.

Howard J, Sutton-Grier A, Herr D, Kleypas J, Landis E, Mcleod E, Pidgeon E, Simpson S (2017) Clarifying the role of coastal and marine systems in climate mitigation. Front Ecol Environ 15:42–50.

Howard, J., Hoyt, S., Isensee, K., Pidgeon, E., Telszewski, M., & Newsletter, N. W. (2014). Coastal Blue Carbon. *Conservation International*, *36*(1), 180.

Ibrahim, A. S., & Ngigi, T. G. (2017). Assessment of mangrove spatial-temporal dynamics and biomass by remotely sensed data case study Kilifi County: Kenya. *J. Geosci. Geomatics*, *5*(1), 24-36.

IPCC. (2014). CHAPTER 4: Coastal Wetlands. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, 1–55. http://www.ipcc-nggip.iges.or.jp/public/wetlands/

IPCC. (2017). *Sixth Assessment Report (Ar6) Products*. *2*(March), 28–31.

Juma, G. A., Magana, A. M., Michael, G. N., & Kairo, J. G. (2020). Variation in Seagrass Carbon Stocks Between Tropical Estuarine and Marine Mangrove-Fringed Creeks. *Frontiers in Marine Science*, *7*, 696.

Kairo, J. G., Kivyatu, B., & Koedam, N. (2002). Application of remote sensing and GIS in the management of mangrove forests within and adjacent to Kiunga Marine Protected Area, Lamu, Kenya. *Environment, Development and Sustainability*, *4*(2), 153–166. https://doi.org/10.1023/A:1020890711588

Kirui, K. B., Kairo, J. G., Bosire, J., Viergever, K. M., Rudra, S., Huxham, M., & Briers, R. A. (2013). Mapping of mangrove forest land cover change along the Kenya coastline using Landsat imagery. *Ocean and Coastal Management*, *83*, 19–24. https://doi.org/10.1016/j.ocecoaman.2011.12.004

Konar M, Ding H (2020) A Sustainable Ocean Economy for 2050 Approximating Its Benefits and Costs Secretariat of the High Level Panel for a Sustainable Ocean Economy, World Resources Institute. Secr High Lev Panel a Sustain Ocean Econ World Resour Inst.

Lovelock, C. E., Ruess, R. W., & Feller, I. C. (2011). CO 2 efflux from cleared mangrove peat. *PloS one*, *6*(6), e21279.

Ludw, H., & List, F. (2007). *Global Mangrove Distribution and Degradation: How Good or Bad Is It ?* 47–48.

Marchio, D. A., Savarese, M., Bovard, B., & Mitsch, W. J. (2016). Carbon sequestration and sedimentation in mangrove swamps influenced by hydrogeomorphic conditions and urbanization in Southwest Florida. *Forests*, *7*(6), 116.

McLeod E, Chmura GL, Bouillon S, Salm R, Björk M, Duarte CM, Lovelock CE, Schlesinger WH, Silliman BR (2011) A blueprint for blue carbon: Toward an improved understanding of

the role of vegetated coastal habitats in sequestering CO_2. Front Ecol Environ 9:552–560.

Mungai, F., Kairo, J., Mironga, J., Kirui, B., Mangora, M., & Koedam, N. (2019). Mangrove cover and cover change analysis in the transboundary area of Kenya and Tanzania during 1986–2016. *Journal of the Indian Ocean Region*, *15*(2). https://doi.org/10.1080/19480881.2019.1613868

Murray, B. C., Pendleton, L., Jenkins, W. A., & Sifleet, S. (2011). Green payments for blue carbon: economic incentives for protecting threatened coastal habitats. *Green payments for blue carbon: economic incentives for protecting threatened coastal habitats.*

Nellemann C, Corcoran E, Duarte CM, Valdés L, De Young C, Fonseca L, Grimsditch G (2009) Blue Carbon. A Rapid Response Assess:80 p.

Pendleton L, Donato DC, Murray BCE, Crooks S, Jenkins WA, Sifleet S, Craft C, Fourqurean JW, Kauffman JB, Marba N, Megonigal P, Pidgeon E, Herr D, Gordon D, Baldera A (2012) Estimating global 'blue carbon' emissions from conversion and degradation of vegetated coastal ecosystems. PLoS One 7:e43542.

Siikamaki, J., Sanchirico, J. N., & Jardine, S. L. (2012). Global economic potential for reducing carbon dioxide emissions from mangrove loss. *Proceedings of the National Academy of Sciences*, *109*(36), 14369-14374.

Schuerch, M. et al. (2018). Future response of global coastal wetlands to sea-level rise. *Nature, 561(7722),* (Future response of global coastal wetlands to sea-level rise.), 231-234.

Stuchtey MR, Vincent A, Merkl A, Bucher M, Haugan P, LuBCEheno J, Pangestu ME (2020) Ocean Solutions That Benefit People, Nature and the Economy.

Valiela, I., Bowen, J. L., & York, J. K. (2001). Mangrove forests: One of the world's threatened major tropical environments. *BioScience*, *51*(10), 807–815. https://doi.org/10.1641/0006-3568(2001)051[0807:MFOOTW]2.0.CO;2

Waycott, M., Duarte, C. M., Carruthers, T. J., Orth, R. J., Dennison, W. C., Olyarnik, S., ... & Williams, S. L. (2009). Accelerating loss of seagrasses across the globe threatens coastal ecosystems. *Proceedings of the national academy of sciences*, *106*(30), 12377-12381.

7.0   ANNEXES

7.1   Detailed Review of Key Environmental Legislations, Polices and Strategic/Sectoral Plans

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
1	**The Constitution of Kenya, 2010**			
	Chapter Four—The Bill of Rights Part 2—Rights and Fundamental Freedoms pg 31	In article 42. the constitution recognizes that a healthy environment is a right to human and should be protected to benefit now and future generations	Provides an opportunity for enabling frameworks for environmental protection including the blue carbon ecosystems.	Identify opportunities for inclusion of Blue Carbon Ecosystems in existing policy and legislative framework
	Chapter Five—Land and Environment Part 2—Environment and Natural resources pg 46	Article 69 (b) outline the State's obligation to ensure tree cover of at least 10% is achieved of the land area of the country	This is an opportunity for mangrove ecosystems to be included and facilitated financially during the restoration endevors to achive the 10%	Leverage on this to implement mangrove conservation and restoration for climate change mitigation and adaptation and other benefits.
2	**National Climate Change Framework Policy (GOK 2017)**			
	The contextual framework of the policy	The policy framework outlines four (4) key aspects: i) Enhancing climate resilience and adaptive capacity ii) Low carbon growth iii) Mainstreaming climate change into the planning process iv) Enabling regulatory framework	Provides policy framework for integrating ocean climate actions into climate change interventions	Identify BCEs strategic objectives and priority actions that can leverage on the policy framework
	2.2 Impacts of climate change in Kenya i) Fisheries sector	i) Impacts of climate change on fisheries highlighted, though emphasis seems to be on inland aquatic ecosystems	i) Climate change risks and vulnerability analysis on the coastal and marine	i) Incorporate the marine fisheries sector in climate change risks and

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No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
	ii) Tourism iii) Coastal and marine ecosystems	ii) Impacts of coastal and marine climate change feedbacks on tourism sector highlighted iii) Impacts of climate change on the coastal and marine ecosystems well-articulated	fisheries sector not well highlighted, including the linkage with the blue carbon ecosystems ii) Adverse effects of climate change on the tourism sector and coastal and marine ecosystems provide an opportunity to advocate for ocean climate solutions, especially the blue carbon ecosystems	vulnerability assessment and the linkages with the BCEs ii) The policy provides the opportunity to incorporate ocean climate actions into climate change intervention measures. Therefore, there is a need to identify and prioritize suits of ocean climate actions to be integrated into Kenya's NDCs
	2.3 National emissions profile (pg 15) 2.3.1, 2.3.2	i) National GHG inventory report (NIR) was updated in 2010 for NCCAP. ii) Baseline emissions scenarios and projections are developed based on the updated National GHG inventory. iii) Emissions reporting for mangroves are usually considered to be under the LULUCF sector, under the wetlands subsector iv) The forestry sector forms one of the largest GHG emitters in the country through degradation.	While mangrove cover change is categorized under the LULUCF sector, analyses of the NIR indicates that emissions from mangroves and other coastal wetlands (BCEs) were not included No disintegrate information to show what the Blue carbon forest emits	i) Incorporate BCEs into NIR ii) The contribution of BCEs to the carbon sinks and emissions need to be quantified

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		v) By 2030, forestry is projected to reduce its GHG emission due to reduced degradation.	No mention of how much the BCEs will reduce emissions	
	2.4 Climate change governance	Highlights the need to harmonize sectoral policies and the need for proper coordination and mainstreaming of climate change into sectoral plans	Provides an opportunity to mainstream ocean climate actions into climate change interventions	To provide policy direction for mainstreaming ocean climate actions into sectoral plans
	2.5 Climate change opportunities	Opportunities in climate change are highlighted: i) Realigning development model into a climate-resilient framework ii) Climate finance iii) Devolution	Provide opportunities for BCEs to be included in development plans to enhance resilience, attract climate financing, and integrated into county development plans	Identify BCEs priority actions that can leverage on the opportunities arising from climate change
	3.0 Goal, Objectives, and Guiding Principles	These are well articulated with regards to combating climate in all the sectors	The policy provides the opportunity for the inclusion of ocean climate actions in climate change response strategies	
3	**Climate Change Act, 2016 No.11 of 2016**			
	Part iii 13 (3) Pg. 191	The national climate change act shall prescribe measures and mechanisms i) To guide the county towards the achievement of low carbon climate-resilient sustainable development	The act provides the opportunity for incorporating and mainstreaming ocean climate actions to all	Build capacity to understand their role of BCEs in climate change mitigation and adaptation process..

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		ii) To set out action for mainstreaming climate change response into sectors functions iii) To specifically identify all actions required as an enabler to climate change response	relevant sectoral plans and development agenda.	
	13 (8) pg. 193	The cabinet secretary shall in every five years review and update the national climate change action plan	This provides the opportunity to incorporate ocean systems during the review and update of the national climate action plan, the important role of BCEs can be articulated	Recommend inclusion BCEs in the updated national climate change action plan
	Schedule (s.4(2)(f) Pg. 207 2 (c)	Provision on public participation The notice shall in each case- invite written comments on or objections to the policy, strategy, program plan, or action	The schedule provides a window where the role played by the BCEs can be emphasized	Include BCEs as mitigation and adaptation measure as provided for by the schedule
4	**National Climate Change Response Strategy (NCCRS) 2010**			
	Pg 11	Table: Estimated annual Budget for proposed climate change projects and programs	Marine and Fisheries resources estimated to cost Ksh 2.32 billion	Identify key BCEs focal areas to invest in
	Introduction pg 22	1.2 International efforts and challenges to combating climate change Kyoto protocol introduces the Concept of carbon markets	Provides opportunity for BCEs	Incorporate Blue carbon trading to make carbon markets more understandable to the public

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
	Pg25	Adaptation Fund created under the Kyoto protocol recognizes coastal zone management as interest areas that would benefit from this fund.		identify BCE actions that can be funded
	2.0 Evidence and impacts of climate change in Kenya pg 27	Coastal strip temperature and rainfall variation are recognized	Models to show the change over time	Develop more detailed models accounting for all climate change variables especially those that affect the BCEs
	2.2 Impacts of climate change in Kenya: 2.2.1 Impacts on Natural Systems Pg30-33	Mangroves are recognized as being affected by sea-level rise Coastal and Marine Ecosystems effects of sea-level rise, submergence, displacement of coastal wetlands due to shoreline erosion, increase in salinity compromising the salt wedges in estuaries Coral bleaching due to SST Mangrove sedimentation causing die-backs and loss of fisheries habitats due to flooding	This underscores the threats of climate change to BCEs	The impacts of climate change on BCEs and the consequences of their degradation and loss need to be assessed/quantified Demonstrate the advantage and opportunities that BCEs offer against the negative impact of climate change
	Pg 36	Climate change affects the tourism sector through destruction of tourist sites such as marine ecosystems especially coral reefs which are significantly being bleached due to SSTs, submergence of beaches		Demonstrate the connectivity of coastal and marine ecosystems as well as their link to economic activities like tourism at the coast
	Pg 37	Identifies the effects that come with climate change to the fish food web, breeding, and	Generalize wetlands changes impacts but no	Identify and map changes in BCEs

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		feeding as well as the ecology of the fish life cycle	direct reference made to changes BCEs due to climate	
	Pg 38	Impacts on Physical and Social Infrastructure marine transport sector affected by sea-level rise-ship yards submergence, transport corrosion due to ocean acidification, strong ocean winds affect ship navigation.		Elaborate BCEs role in minimizing the ocean wind effects, sea-level rise translating to the safer marine transport sector and costal protection role of BCEs
	Pg40	Human settlements and land use	Vulnerability of coastal people to risks and impacts of sea-level rise underscores the roles of BCEs in climate change mitigation and adaptation	Role of BCEs in minimizing the effects of sea-level rise.
	3.0 Strategic focus of NCCRS PG 46-47	i) Conduct periodic vulnerability assessments, impacts monitoring at national and local levels, GHGs monitoring, and provide capacity building framework that will help prepare for the effects of extreme events such as the sea-level rise ii) Identify specific Research and Development needs to address climate change, and opportunities for technology development, absorption, and diffusion	Opportunities for strengthening policy framework and capacity for BCEs integration in to implementation and monitoring frameworks	i) Conduct BCE vulnerability assessment ii) BCEs research development capacity iii) Strengthen policies that deal with BCEs or formulate new policies to cover BCEs where such policies do not exist iv) Strengthen the ocean action plan that is tailored to mitigate climate change

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		iii) Strengthen governance of climate change, that is, policy, legislation and institutional frameworks iv) Provide an Action Plan and ensure its implementation in terms of having robust monitoring and evaluation framework		
	4.0 Adaptation and mitigation intervention pg 50	Recognize the impacts of climate change through the effect of sea level	But does not adequately outline adaptation and mitigation measures to deal with this	Identify BCE mitigation and adaptation actions
5	**Climate Finance Policy 2016**			
	Pg 4	1.3.4 Policies and Laws Informing this Policy	Policy documents for coastal ecosystems to be considered	Mangrove management plan to give specific issue around the coastal ecosystems
	Pg 19	3.2 Forestry – priority actions: i) Reduction of deforestation and forest degradation; ii) Conservation and sustainable management of forest areas; iii) Increased afforestation and reforestation activities, such as restoration of dry and arid land forests and reforestation of degraded forests; and	Opportunities for mangrove conservation and restoration	Identify priority actions for mangroves Allocate funds for green community projects i.e. restoration Develop a plan for procedure and disbursing climate funds for conservation initiatives disbursing and

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		iv) Development of sustainable fuel wood plantations.		
			No clear way of how the funds can be assessed	Design and implement green projects that are meant to mitigate the impacts of climate change. ?
	4.0 Strategic interventions Pg 25	Interventions are mentioned on how to ensure the climate fund is well utilized. Just to highlight some of these interventions that could be give positive guidance to the development of climate actions include: Legal and regulatory framework: i) Establish a national climate finance mechanism (a Climate Change Fund) within the legal framework established in the Climate Change Act, 2016 to support the funding of activities ii) Augment the mandate of the National Climate Change Council to provide an overarching national climate change coordination mechanism, through development and setting up of an integrated platform to support the mobilization, coordination, access	This provides numerous opportunities for climate funding for ocean climate actions	Identify and prioritise BCE climate actions to be funded through the various mechanisms provided by the policy Develop the capacity of institutions that are involved in the conservation and management of blue carbon forests such us Kenya Forest Services, Community Forest Associations to develop low carbon initiatives with local communities. Cheap and cost friendly carbon projects can be designed and implemented at local community levels Establish a capacity building programme at national and county levels to assist priority government institutions, financial institutions, project developers, and civil society in developing bankable projects.

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No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		to, and tracking of climate finance in Kenya, including both domestic and international sources. iii) Work with the National Climate Change Council and the ministry responsible for climate change affairs to develop regulations for duties relating to climate change, within the legal framework established in the Climate Change Act, 2016. iv) Foster strong national and county financial systems for climate finance building upon principles of the Public Finance Management Act, 2012 (as Amended 2014) while identifying and coding climate change expenditure within the national budget to aid in transparency and accountability of climate finance. v) Develop laws and regulations for tracking climate finance mobilisation and application, in line with guidelines to comply with reporting requirements of the Paris Agreement on financial, technology		Develop clear and transparent modalities of collecting and using the climate funds i.e. through clear tax mechanisms that can be used for the payment of ecosystem services schemes. Develop a monitoring and evaluation process to ensure that the climate funds and implemented projects are in line with the agreed interventions The institutions charged with the management of blue carbon forests could develop websites and social media platforms where successes through carbon projects are highlighted so to encourage the groups that are involved or to win new funding for the projects Clear marketing strategies for carbon projects should be established and policy document developed in this line to ensure a uniform way of carbon trading to enhance the carbon finance pool.

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		transfer capacity building support received by developing countries.		
		vi) Develop new legislative instruments to govern the terms and type of involvement of entities in GHG emission reduction initiatives and carbon market initiatives. New instruments will be designed to facilitate GHG emission reduction initiatives and carbon market engagement.		
		vii) Identify and implement fiscal, taxation and other policy options (such as green bonds) in priority areas with high GHG emission abatement potential or high climate resilience benefits.		
		viii) Identify legal and regulatory barriers that discourage private sector and financial sector low-carbon and climate resilient investment, and suggest solutions.		
		ix) Promote an enabling policy framework for investment and create business- friendly regulatory environments to encourage investment of climate finance in key		

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		areas such as renewable energy, efficient transport, clean manufacturing. sustainable agriculture and drought management. x) Use policies, laws and regulations to develop market-based and non-market-based mechanisms.		
	Pg 26	Governance and institutional Framework: i) Mainstream low carbon growth and climate resilience options into the planning and budgeting processes and functions of the national and county governments. ii) Strengthen the capacity of priority institutions at the national and county levels to access, disburse, absorb and manage climate funds in a transparent and accountable manner. iii) Strengthen the capacity of priority institutions at the national and county levels on matters related to fiduciary standards and management, and environmental and social safeguards. Adopt and implement sector specific anti-corruption, transparency, accountability and integrity mechanisms	opportunity to include BCEs in the capacity building programmes	Develop plans for implementation of the capacity building programes Ensure inclusivity and proper representation of institutions working on different thematic i.e. BCEs focus has been on those working on terrestrial an freshwater Design the content for capacity building

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		to safeguard prudent management of climate finance.		
		iv) Provide advice to county governments on priority actions and strategies related to climate change that should be in integrated into functions and budgets of department and entities of county governments.		
		v) Establish a capacity building programme at national and county levels to assist priority government institutions, financial institutions, project developers, and civil society in developing bankable projects.		
		vi) Develop a capacity building programme to help national and local financial institutions assess the risks of new climate-related technologies and design innovative financial schemes to support industry in adopting them.		
		vii)g) Augment existing coordination committees under the National Climate Change Council, such as the informal Joint Sector Working Group and the Inter-Ministerial Climate Finance Technical Advisory Committee with the new climate finance mechanism (Climate		

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		Change Fund) to track and coordinate climate finance and harmonise at the national and county levels. viii) Facilitate information dissemination and knowledge flow on climate finance.		
6	**National Climate Change Action Plan (NCCAP, Vol I 2018-2022) (GOK 2018)**			
	National Legal and policy framework and strategies for climate actions Page 39-42	Highlight the enabling policy and legal framework at the national level for combating climate change	i) Policy issues and strategies specific to coastal and marine systems not captured. ii) Land use management strategies emphasize more on terrestrial settings – e.g. Systems for Land-based Emissions Estimation in Kenya (SLEEK)	i) To develop a policy framework for ocean climate actions. ii) To incorporate coastal and marine systems in emission estimation or develop systems specific to seascape emissions estimation
	Priority climate actions Priority #2: Food and nutrition Page 56	Highlight the decline in the fisheries sector, including marine fisheries	Climate change effects on fisheries emphasized, but it is not linked with BCEs	Link fisheries subsector, especially the coastal/inshore fisheries with the BCEs and the associated climate change effects

	Priority #3: Water and the Blue Economy
	Page 62, 66
		Priority actions include:
		i) Improving the resilience of coastal communities
		  a. Increase deep/offshore fisheries
		  b. Rehabilitate and restore mangroves
			Broadly addresses the issues of coastal and marine areas	Implementation to include specific actions for the blue carbon ecosystems, especially the seagrass meadows.
				Integrate the BCEs into the BEMP

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		c. Conserve at least 15% of coastal and marine areas, especially areas of importance for biodiversity and ecosystem services ii) Develop the Blue Economy Master Plan (BEMP)		
	Priority actions for County Governments: Coastal Economic Block – Jumuiya ya Kaunti za Pwani Page 92	Mainstreaming climate change into county programs and planning	Opportunity to mainstream ocean climate strategies to development plans and programs of coastal counties	Integrate BCEs specific actions into the county programs and plans
	Delivering NCCAP Enabling action #4: Climate finance and resource mobilization Page 112-113	i) Build capacity for national institutions to gain accreditation for international finance mechanisms and to develop bankable proposals. ii) Develop a climate finance resource mobilization strategy that includes domestic allocation, international climate finance, access to carbon credits and markets, allocation from the private sector, and Public-Private Partnerships for climate-friendly investments. iii) Participate in the design and implementation of market-based mechanisms.	A plus for the ocean climate actions i) Strengthening the financial mechanisms for investment in nature-based climate solutions. ii) Enhancing resources mobilization frameworks and strategies.	i) Identify and develop ocean nature-based climate solutions to leverage on the established enabling aspects of climate finance mechanisms. ii) Carry out a cost-benefit analysis of ocean nature-based climate actions to be incorporated and to inform on trade-offs in development programs and shift to sustainable ocean development. iii) Prioritize the ocean climate actions to be financed through PES schemes, such as carbon offset programs.

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
		iv) Promote investor confidence and participation in market-based and results-based mechanisms. v) Enhance Kenya's capacity to engage in carbon asset activities. vi) Strengthen the viability of domestic carbon asset production; and vii) Increase access to international carbon markets		
	Enabling action #5: Transparency: measurement, reporting, and verification plus (MRV+)	i) Establish the M&E component of the MRV+ system to report on adaptation actions and benefits, including the identification and measurement of such adaptation indicators as collected baseline data, gender-disaggregated data, and gender indicators. ii) Establish a functional system to develop Kenya's GHG inventory and an MRV system for tracking mitigation for NDC reporting. iii) Strengthen capacity for carbon management and verification. iv) Establish a system to track and report on land-based emissions; v) Develop a monitoring and reporting system for a transparent accounting of	i) These enabling actions provide an opportunity to develop strategies for designing and tracking programs for ocean climate actions ii) However, the emphasis is on mainly land-based systems	i) Leverage on the proposed enabling actions to develop and strengthen the capacity for • tracking and reporting ocean-based adaptation actions • incorporating ocean-based mitigations into Kenya's GHG inventory and MRV+ ii) BCE carbon management and verification iii) Establish a system to track seascape-based emissions or expand the system for tracking land-based emissions to incorporate emissions from coastal and marine systems

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		emissions and removals in the forestry and land-use sectors		
7	**NCCAP Adaptation Technical Analysis Report (ATAR) Vol II 2018-2022**			
	Background and context 1.2.5 Impacts of Climate Change in Kenya (Pg 3-9)	Key issues highlighted include Degradation of marine and coastal ecosystems, including mangrove forests, coral reefs, seagrass beds, beaches, deltas, and coastal agriculture	Seagrasses are mentioned once in this document in terms of degradation but there is no adaptation plan for these ecosystems	Impacts of climate change on BCEs, especially seagrasses need to be documented
	1.2.6 Impacts Climate Change on Sectors in Kenya (pg 9)	Ocean acidification highlighted as one of the impacts of climate change	Information on the effects of ocean acidification on coastal flora and fauna is not included	Link ocean acidification to effects on fish and shell builders like oysters, corals, fish, seaweeds, and others, which in turn affects coastal ecosystems and livelihoods. The seamless connectivity of the three critical ecosystems (mangrove, seagrass and corals) need to be highlighted and how impact on one will affect the rest.
	Table 1.2: Sector-based impacts of climate change	i) Effects of climate change on coastal zones ii) Fisheries	Effects of climate change on coastal zones are mentioned including effects on mangroves. But excludes other BCES such as seagrasses and corals Effects of climate change on coastal nursery habitats and fisheries not mentioned	The impact of climate change on seagrasses and corals should be included as information is already available. It should be further linked to livelihoods and human well being Link coastal fisheries and nursery habitats such as mangroves and seagrasses. Climate change impacts on

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		iii) Forestry	The problems mentioned are basically for terrestrial forests, not intertidal forests	these BCEs will affect fisheries directly or indirectly Include sea level rise and inundation as a climate change threat that is unique to mangroves
	Strategic objective 4(Pg51) Forestry	i) Increase forest cover to 10 percent of total land area ii) Enhance Forest Landscape Restoration Initiatives, with forest cover benefits	The actions highlighted are basically for terrestrial systems. Mangroves fall under the definition of forest in Kenya, hence this is an opportunity for mangrove conservation and restoration	Deliberate recognition of mangroves and including them as contributors to the 10% forest cover Include market-based approaches like PES and carbon trade as possible benefits of improved forestry In addition to terestial encourage protection and restoration activities and support them financially
	Chapter 3: Adaptation Actions the 2018-2022 Period (Pg 32 – 80)	i) Tackling Marine and Coastal ecosystem degradation is one of the 6 action plans. ii) Highlights on the climate change-related disasters in different regions including the coast	i) Seagrasses are mentioned as degraded systems but there is no further mention in the entire document ii) The risk of sea-level rise in coastal areas has not been included	Include seagrasses in action plan guided by the Seagrass Management Plan Sea level should be included as a unique risk to coastal areas and there should be strategic action for sea-level rise
	Strategic Action Area 11: Marine and Coastal Resources Sector (Pg71-73)	i) Mainstreaming climate change adaptation into the Blue Economy is well articulated in this section ii) Restore and co-manage degraded mangrove forests	i) The role of mangroves in shoreline protection from erosion as well as extreme events like	Link healthy mangroves to shoreline protection from erosion and also as a buffer between land and sea thus protecting land based infrastructure from strong waves

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			Tsunami has not been mentioned ii) The role of mangroves in climate change mitigation has not been mentioned as an expected result	Climate change mitigation of healthy mangroves through increased carbon sequestration as one of the expected results
	-			The benefits of restoration and co-management of mangroves need to be well articulated in the document and especially their role in sequestering carbon
	ATAR 2018 – 2022 Implementation Matrix (Pg 98-99)	Reforestation, afforestation in landscapes are well included in the matrix.	The expected outputs and actions are heavily on landscapes with no mention of seascapes	Include the seascape as well to capture mangroves, their restoration mentioning what acreage needs restoration
8	**NCCAP Mitigation Technical Analysis Report (MTAR) Vol III 2018-2022**			
	Table 3-page 5	Mangroves mentioned together with other forestry section actions *Reduce deforestation and forest degradation by rehabilitation and protection of additional 100,000 Ha of natural forests (including mangroves) by 2022*	Not clear how many ha of mangroves are to be rehabilitated and mangroves are mentioned as an addition to the other forests thus bracketed. Only mangroves mentioned	The cover of mangrove forests to be rehabilitated and how should be included. The document is quite general in the mention of mangroves. Other ecosystems like seagrass, should be included in the document as recognized by the UNFCCC

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	Forestry (LULUCF) Sector Kenya's GHG emission baseline and mitigation targets Pg 10, 11	Highlights include: i) *2.1 Kenya's baseline GHG emissions projections*: a. Kenya's total GHG emissions from all the six sectors combined would grow to about 100 and 143 million tonnes of carbon dioxide equivalent (MtCO2e) by 2022 and 2030, respectively. In 2030, the forestry (LULUCF) will contribute 22 MtCO2e, being the third contributor after energy and agriculture sectors. ii) *2.2 Kenya's mitigation NDC and technical mitigation potential of all the sectors*: a. Kenya has a mitigation potential of 60% (85.8 MtCO2e), however, the NDC seeks to abate the country's GHG emissions by 30% (42.9 MtCO2e) by 2030 relative to the BAU scenario of 143 MtCO2e. b. The forestry (LULUCF) has mitigation potential of abating 40.2 MtCO2e, but the 2030 NDC target is 20.1 MtCO2e. c. To achieve the NDC target, Kenya has to introduce policies, programs and technologies that encourage emission reductions and drive the country to low carbon development pathway.	i) The LULUCF sector comprise of the forestry and wetlands subsectors. ii) The contribution of BCEs to GHG emissions not captured in the baseline emissions and projections. iii) The aspirations by Kenya to introduce policies, programs and strategies to provide enabling conditions for emission reductions provide oppoertunities for incorporating BCEs in mitigation targets.	i) Identify strategies to incorporate BCEs in mitigation policy directives, programs and strategies. ii) Conduct GHG inventory for BCEs

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	Proposed mitigation actions Pg 62 - 74	Key highlights: i) In the LULUCF sector, the transitions in forests, through clearing of forested lands for agriculture, urban development or settlement, as well as wood harvesting, account for most greenhouse gas (GHG) emissions of carbon dioxide (CO2) in the sector. ii) In the NCCAP 2013-2017, it was estimated that the total GHG emissions from the forestry (LULUCF) sector was 21 MtCO2e per year (30% of total national emissions) in 2010 and was projected to increase 26 MtCO2e (32.5% of the total national emissions) by 2015 before reducing to 22 MtCO2e per year (15.4%) by 2030. At this level, the forestry sector would be the second-highest emitter of GHGs after the agriculture sector iii) Baseline emissions projections uncertainties have been acknowledged due to uncertainty in actual forest cover, activity data and emission factors iv) The Bonn Challenge is a global effort to restore 150 million hectares of the world's degraded and deforested lands by 2020 and 350 million hectares by	i) The national GHG inventory does not include the contributions of mangroves and other coastal wetland systems ii) The restoration programs under Bonn Challenge, REDD+ and community participatory frameworks provides an opportunity for mangrove forest restoration iii) Opportunities to develop and upscale MRVs for the BCEs iv) The mitigation actions and the enabling conditions provide opportunities for inclusion of mangroves	i) Proper mapping of the extent of mangroves and seagrasses should be carried out and this should be reported. ii) Idenfify BCEs degraded sites that can be incorporated to the Bonn Challenge iii) Identify BCEs priority actions and capacity needs for development of appropriate strategies and technologies iv) Map and delinieate areas/ha of BCEs that require restoration v) Working with community groups that have been formed to rehabilitate degraded BCEs

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		2030. Under this program, Kenya's restoration target is 4.21 mHa, out of which, 10,000ha targeted for degraded forests
		
		v) Mitigation actions include:
		  a. Reduce deforestation and forest degradation by rehabilitation and protection of additional 100,000 Ha of natural forests (including mangroves) by 2022 with an abatement potential of 2 MtCO2e by 2030 (achieved through the opportunities of REDD+, Community participation and participatory forest management)
		  b. Three forest resources (timber, charcoal and firewood) efficiently utilised in all counties by 2022
		  c. Employing MRV technologies
		vi) Enabling conditions:
		  a. Technologies required for:
		   - restoration of forests on degraded lands requires technigues on community forestry programs, research on degraded lands and appropriate conservation techniques, forest management and planning, protection and conservation		

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		- rehabilitation of degraded forests requires techniques on tree nurseries and production of seedlings, tree planting, forest management and planning silvicultural interventions - reducing deforestation and degradation requires techniques on community monitoring, forest management tools, development of alternatives to reduce demand for fuel wood, financial innovations including payments through carbon markets **b.** capacity building		
	Energy Sector Proposed mitigation actions for 2018-2022 Pg 25-40, 46	Key highlights include: i) Biomass energy (wood, charcoal and agriculture waste) 68% of the national energy consumption; providing basic cooking and heating needs of rural communities, urban poor and informal sector. ii) Clean cooking has the second biggest opportunity in emission reductions, mainly through energy efficiency by use of improved biomass efficient stoves. iii) Development and distribution of 4 million biomass stoves by 2022: achieved	i) Demand for the biomass energy (wood and charcoal) has significant effect on the mangrove ecosystems. ii) Adoption of energy efficiency through improved cooking stoves provides an opportunity to enhance mangrove conservation and restoration	Provide strategies and incentives to promote adoption of energy efficiency amongst the coastal communities to reduce pressure on the demand for fuelwood from the mangrove ecosystems Draft policies and guidelines on sustainable use of mangrove wood (that is not needed for building) as a regulated source of firewood

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		through incentives for microfinance (loans), promoting local innovations, supporting small-scale businessbusinessesbusinessesbusiness in distribution and establishment of alternative sources of wood (timber plantations and agroforestry). iv) Strengthen institutional and policy frameworks that promote sustainable wood production v) Strengthen supervision and enforcement with regards to woodfuel sustainable supply and strategies. vi) Capacity building (biomass energy efficiency)	iii) Sustainable utilization of mangrove firewood	Training and financing local communities on i.e. biogas production and charcoal briquettes as alternative sources of energy
9	**Kenya National Adaptation Plan: 2015-2030, Government of Kenya, July 2016**			
	Section 2.5 Page 12	**Implementation roles** Research institutions are required to provide evidence for knowledge-based decision-making by the national and county governments, private sector, development partners, and civil society amongst others. This will be done through research conducted on different aspects of climate change adaptation and resilience, including improving the understanding of climate change attribution	Provision forthe research institutions and Universities to contribute through evidence-based research Funding for needs driven research on BCES	Through research and current data demonstrate the role and capacity of BCEs in improving adaptation and mitigation measures to climate change Provide a forum where decision makers can inform researchers on the knowledge gaps on the role of BCEs on climate mitigation and adaption

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		in Kenya and providing information on the appropriate mix of adaptation actions.		
	Climate hazards and vulnerability analysis Page 15-19	Key climatic hazards in Kenya namely droughts, floods, and sea-level rise to inform key adaptation actions are highlighted.	Broadly addresses the climate change effects that occur due to droughts, flooding, and rising sea levels in the coastal regions.	i) To include BCEs in coastal vulnerability assessments. ii) Develop climate change adaptation strategies that consider the inclusion of BCEs.
	Pg. 18	Coastal and marine resources contribute immensely towards the economic development of Kenya through tourism, fisheries, shipping, and port activities. Tourism and shipping are the highest contributors to the coastal economy, while small scale fishing contributes 95 percent of the total marine catch	The most critical role of the BCEs not captured in the document	Promote the knowledge and awareness of the capacity of BCEs in contributing to coastal economy as well as mitigating climate change and extreme phenomena/events
	Devolution Page 22	Highlights on the need to mainstream climate change adaptation into County Integrated Development Plans and other county plans for delivering and coordinating adaptation at the county and community levels.	Policies and strategies specific to coastal and marine ecosystems are not captured. Provides opportunity to mainstream BCEs in to county development plans and programs for adaptation	i) Integrate BCEs specific actions into the county programs and plans ii) Inclusion of BCEs in national economic development plans. iii) Adopt national and county policies that create financial incentives for protecting and conserving BCEs, such as payments for ecosystem services programs. iv) Include management of BCEs within integrated coastal management plans.

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				v) Associate the well-being of blue carbon ecosystems with the blue economy vi) To have close consultations and collaborations (Cross-sectoral) engagement with experts from other policy fields e.g. biodiversity protection and nature, fisheries, SDGs reporting, etc. vii) Have intergovernmental coordination mechanisms to ensure BCEs are embedded into and aligned to all the relevant political architecture (involvement from all relevant ministries, agencies, and other policy-making groups.)
	Energy Page 23	Emphasis on increasing the resilience of current and future energy systems. Actions highlighted include; ✓ Continue the rehabilitation of water catchment areas to provide sustainable ecosystem services, including energy production.	Emphasis is on terrestrial system	i) Link the energy sector with BCEs especially in the protection of BCEs (e.g mangroves for wood fuel) by providing alternatives for fuel.
	4.2 Proposed sectoral adaptation actions	Kenyan universities and research institutes already possess a strong scientific foundation necessary to promote further	Opportunities for universities and research institutions to develop BCEs research agenda	i) Strengthen BCEs science policy and practice

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	Science, Technology, and Innovations Pg. 24	research and development into local risks and adaptation options.		ii) Promote the knowledge and awareness of the capacity of BCEs in mitigation and adaptation strategies iii) Upscale successful technologies linked to BCEs iv) Promote the development of locally available technologies in support of BCEs. v) Support in research development on BCEs by the relevant agencies
	Human resource development, labor, and employment Page 26	Enhancing adaptive capacity and resilience of the informal private sector has been highlighted.	Opportunities to build capacity of private sector to intergrate BCEs into their programs	i) Enhance access to the national and international Climate Fund opportunities for climate-proofing investments to increase opportunities for small and medium enterprises in the BCEs. ii) Conduct capacity building on 'green jobs' and enterprises in the BCEs sector.
	Land Reforms Page 28	Mainstream climate change adaptation in land reforms. Actions highlighted include: i) Integrate climate change scenarios into spatial planning (climate-resilient spatial planning). ii) Update land-use plans with climate scenarios.	Opportunities to intergrate BCEs in to spatial and landuse planning	i) Include BCEs as part of marine spatial planning and other tools for managing multi-use coastal landscapes. ii) Support coastal planners and policymakers on adaptation strategies

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	Education and training Page 29	Enhance education, training, public awareness, public participation, public access to information on climate change adaptation across public and private sectors are highlighted.	Emphasis is more on the provision of education and training such as curriculum development and review and delivering appropriate sectoral training. This gives an opportunity for integrating BCEs in to education, training and public awareness strategies	i) Provide training and technical support to local and national government agencies, field schools, and communities on the value of blue carbon ecosystems and good practices for conservation and restoration. ii) Develop knowledge products and demonstration activities to communicate experience and good practice to support mainstreaming and upscaling of blue carbon interventions.
	Environment Page 31-32 .	Highlights on enhancing climate information services; as well as enhancing the resilience of ecosystems to climate variability and change. Actions highlighted include; i) Review and update existing Environmental Impacts Assessment (EIA) regulations with climate change adaptation considerations. ii) Enhance the capacity to enforce and monitor compliance of adaptation actions.	Broadly addresses the effects of climate change across the different sectors with surging economic and social impacts.	i) Monitor compliance with EIA regulation requirements for coastal BCEs alterations. ii) Kenya defines mangroves as forests hence can be incorporated into the UNFCCC forest mechanisms such as REDD+ and as part of LULUCF activities. iii) Improve reporting of BCEs in the national ecosystem inventory, including forest and GHG inventroy iv) Commence climate vulnerability and risk assessments on ecosystems and

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		iii) Undertake climate vulnerability and risk assessments on ecosystems and guide relevant adaptation actions. iv) Strengthen tree-planting and conservation initiatives. v) Integrate ecosystem and community-based approaches in sector strategies in support of adaptation to reduce natural resource-based conflicts.		guide the relevant adaptation actions. v) Integrate ecosystem and community-based approaches in sector strategies in support of adaptation to enhance resilience. vi) Conduct carbon assessments and ecological and socio-economic assessments of BCEs
	Gender, vulnerable groups and youth Page 35	Highlights on strengthening the adaptive capacity of the most vulnerable groups and communities through social safety nets and insurance schemes. Actions highlighted: i) Create awareness for climate opportunities that women and youth can access. ii) Promote and support climate-resilient sustainable livelihoods	Opportunities for mainstreaming BCEs to livelihood programs	i) Support climate-resilient sustainable livelihoods specific to BCEs ii) Conduct community awareness events on BCEs and climate change iii) Develop documentaries and stories of the role of BCEs in climate change mitigation
	Tourism Page 36	Highlights on enhancing the resilience of the tourism value chain. Actions highlighted: Develop climate-resilient action plans for the sector.		Mainstream BCE ecotourism activities into the Tourism Master Plan for Kenya.
	Fisheries Page 39	Highlights on enhancing the resilience of the fisheries value chain	Emphasis is more on the fisheries sector and the	i) Support management plans to protect BCEs such as the Kenya

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		Action highlighted: i) Upscale sustainable aquaculture initiatives. ii) Strengthen monitoring capacity and capability to prevent overfishing and unauthorized exploitation in the inland waters and Exclusive Economic Zone. iii) Promote the up-scaling of climate-resilient strategies/ technologies in fisheries and climate-resilient fish varieties. iv) Expand the fishing zones in both inland and coastal waters. v) Strengthen the climate-smart public service delivery and climate-resilient county development which will lead to the resilience of national agriculture (livestock development and fisheries) and tourism value chains and hereafter climate-resilient economic growth at a national level. This is expected to lead to enhanced adaptive capacity towards the attainment of Kenya's Vision 2030.	effects of climate change that occur	national mangrove ecosystem management plan. ii) Link the fisheries sub-sector especially the coastal/inshore fisheries with the BCEs and the associated climate change effects. iii) Support BCEs and fisheries conservation.
	Private sector/ trade, manufacturing, business process outsourcing, financial services Page 40	Create an enabling environment for the resilience of private sector investment, demonstrate an operational business case.		i) Develop strategies that promote private sector particiapation in BCEs protection both from an ecological and economic view

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				ii) Give incentives to companies when they appeal for support in investing in BCE initiatives
10	**The Forest Conservation and Management Act, 2016**			
	A general overview of the Act	The Act talks generally about forests and activities related to forests including the management of forests and formation of forest management bodies i.e. Kenya Forest Services, Community Forest Associations.	The mention of forest activities does not capture any issues to do with Climate Change	i) The Act should add or give provision for climate / nature-based activities and the incentives to be given to communities engaging in such activities under community-based activities. This will strengthen the forest Act in line with the Climate Change Act. ii) As much there is the climate change Act, the Forest Act should also align with this by adding a section on Forests and Climate change.
	PART V —COMMUNITY PARTICIPATION	**48.** (1) A member of a forest community may, together with other members or persons resident in the same area, register a community forest association in accordance with the provisions of the Societies Act. **50**. (1) A community forest association that has been granted permission to participate in the management or conservation of a forest association may, with the approval of the Director-General, assign any or all its rights under a management agreement to a	This is a good initiative since it gives room for the engagement of the community groups at different levels of management of blue carbon ecosystems.	The community participation should be extended to other blue carbon ecosystems like seagrasses

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		suitably qualified agent on mutually agreed terms.		
	PART VI—INCENTIVES FOR INCREASING FOREST AND TREE COVER	53.Subject to Article 66 of the Constitution, investors in forests shall share the benefits of their investment with local communities by applying various options including but not limited to infrastructure, education, employment and social amenities and in accordance with rules made under this act or other relevant laws	This is a positive initiative and provision in the Act for it allows for equity in benefit sharing and restoration of the forests which are the main sources of carbon sinks	There should be clear guidelines on how the investment proceeds harnessed from forest restoration projects are shared among the community groups and involved in the restoration of the same forests. A clear co-benefit and equal sharing mechanism should be developed to avoid biases between community and governments
11	**Taskforce Report on Forest Resources Management and Logging Activities in Kenya (GoK, 2018)**			
	3.2.1.5 Destruction, Degradation, and Encroachment Pg. 40	Mangrove forests in Kenya face several threats mainly arising from unsustainable exploitation, tourism development, and large-scale infrastructure: i) Mangrove harvesting is controlled by KFS through licensing procedures and	The importance of mangrove non wood product and benefits are not captured and well-articulated in the document	Promote knowledge and awareness of mangroves highlighting the critical roles they play within and beyond the country and the negative impacts of their degradation and loss.

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		recommendations of mangrove poles to be harvested. However, these recommendations are based on wood demand rather than the actual resource base; ii) Between 1985 and 2009, the country lost about 20% of its mangrove cover, translating to about 450 ha of mangrove area per year; iii) Also, at least 40% of mangroves across the coast are degraded; iv) Losses of mangroves are disproportionately higher in urban centers than in rural areas. In Mombasa County, for instance, the loss of mangroves is reported to exceed 80% in the last decade; and v) In Lamu County, where a significant proportion of the mangroves is found, it was found that the local communities are sustainably managing the mangroves as a key source of livelihood. However, the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) project threatens the mangrove ecosystem.	Despite highlighting the loss of mangrove in Kenya, what this means in terms of loss of the already captured and stored carbon and the capacity to do the same, has not been articulated	Highlight the role that mangroves play as efficient carbon stores
	3.2.2.1 Pg.45	The Ministry in charge of Forestry should develop regulations on Mangrove harvesting	Although short term recommendation only focus on mangrove harvesting regulations, there is an	Promote the development of conservation and sustainable utilization regulations/strategies of mangrove

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			opportunity to contribute to long term mangrove conservation regulations	ecosystems through the ministry in charge of forest Highlight the importance of developing mangrove harvest plans in the country
12	**National Strategy for Achieving and Maintaining Over 10% tree Cover By 2022**			
	Figure 1 Distribution of the Kenya forest cover (pg 5)	Includes mangroves forest as part of the national forest		
	1. Background **1.1 Rationale for the strategy (pg 6)**	A requirement by the constitution to achieve a 10% tree cover on national land To implement presidential directives to have the 10% tree cover as an avenue to achieve the 2030 global commitment on climate change mitigation through reduced forest degradation Forestry as big contributor to BIG 4	Provides opportunity for mangrove restoration	Identify engagement option that highlights the contribution of mangrove restoration to the 10% tree cover campaigns
	1.2 Extent of National forest cover (pg 7)	311,000 Ha forest land lost between 1990-2015 due to conversion to settlements, crop farming, and infrastructure development	Does not give the specific loss Ha for mangroves	More detailed maps and tables showing cover change for the mangroves
	Table 1 land use areas changes in Kenya pg 7	Outlines forestland and wetlands as some of the key land use changing areas	Is not specific to the mangrove forest	
	Table 2 Forest types (pg 8)	Identifies coastal forest as a bigger classification class of forest and mangrove as a part of	Mangrove is shown to occupy 2.1% of the total National forest area	Details specifics in the species and their cover and distribution
	2. National policies and legal frameworks	Highlight key documents concerning increase in forest cover (Constitution of Kenya, The Kenya Vision 2030, medium-term	Mostly reference is made to the terrestrial forest and	To recognise the role of the current National Mangrove Management Plan and advocate for its implementation

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		plan III (2018-2022), Forest conservation and management Act 2016, Environmental Management and Coordination Act 2015,	with little emphasis on blue carbon ecosystems	
	3. The role of forest in enhancing ecological integrity and National Development (pg 9)	iii) mentions mangrove forests as essential breeding grounds for fish and protect coastal areas from degradation.	No mention role of mangroves in climate change mitigation	
	Table 3: Total forest economic value (pg 10)	Highlights economic value of the specific terrestrial forest,	mangrove is not included	mangrove as a unique forest need a lot of emphasis on its economic values to warrant more conservation attention
	3.2 Contribution of the forest to the economy (pg 10-11)	Give general forest contribution to GDP which is estimated at USD 365 million (3.6%)	Provides an opportunity to highlight the contribution of mangrove ecosystems to GDP	Economic valuation of mangroves of Kenya should provide information on the contribution of these systems to GDP
	3.3 Forest and the Big 4 agenda (pg 11)	The general role of the forest to Housing, Health, manufacturing, and food security	Opportunity to demonstrate the role of mangroves in achieving the Big 4 agenda	
	3.6 Forest and climate change pg 13	Recognize the role of forests in carbon sink and hence the ability of Kenya to reduce greenhouse gas.	Provides opportunities to highlight the role of mangrove forests as significant carbon sinks and how they can be integrated in to climate actions	Need to pinpoint key forests and their key contributions to climate change mitigation
	4 International conventions and obligations: (pg 13-14)	MEAs ratified to ensure restoration of degraded forests, reduction of greenhouse gas.	Provide opportunities for mainstreaming BCEs into MEAs activities	

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	4.2 Forest and SDGs (pg 14)	Outlines key SDGs and how forest play into their achievement	Opportunities for highlighting role of mangroves in achuieving SDGs	Because of the diversity in the forest, it is worth drilling down to specific Blue Carbon forest and their key roles
	5 Drivers of Tree cover loss (pg 15)	Outline drivers mostly associated with terrestrial forests	No mention of threats facing the mangrove such as salt extraction, aquaculture expansion, oil spills, sea-level rise.	
	6 presidential directives (pg 15)	Presidential directives to support the achievement of the 10% National tree cover by 2022.	Reference is mostly to the terrestrial forest.	Noting that mangrove forest is vital tool it the time it gets high recognition in the presidential directives.
	Table 5: area and seedlings requirement for the 10% tree cover. Pg 16	Rehabilitation of degraded mangrove ecosystems. Degrades ha: 17036 Seedlings needed: 18739600	The tree species seedlings not explicit, also the specific areas requiring restoration	
	9. the strategy 9.3 Rehabilitation and conservation of mangroves pg 19	Recognizes the mangrove management plan and key activities enshrined in it: rehabilitation, licensing of mangrove harvesting, development of restoration guidelines	Opportunity	
	9.15 Public education awareness and sensitization on tree growing. pg 24	Recognize global tree events for growing trees that can be included in the school co-circular activities	does not mention the international day of mangroves	Mark in the government calendar a critical international day of Mangrove

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	9.18 provisions of incentives and awards to support conservation and management. Pg 25	ii-Mention carbon in general as one of the ecosystem services	Does not distinguish into the different sources such as blue carbon	
	9.21 mobilization of finances vi) REDD+ strategy. Pg 26	Formulation of REDD+ strategy and investment to facilitate carbon trading and access to other global carbon finance sources	No, distinguish to the blue carbon trading and financing	Proper reference of the REDD+ programs and carbon trading to allow for specific targeting financing sourcing
	14 Implementation matrix table. Conservation and Rehabilitation of mangroves forest areas: pg 31	details cost of implementing mangrove management plan and rehabilitation of degraded mangrove forest areas	Need for county-specific expenditure for proper fund allocations	
	16.1 Annex1 forest areas managed as public forest as of December 2017	Mostly outlines terrestrial forest	Mangrove ecosystems are not included	
13	**Intergraded Coastal zone management (ICZM) Policy 2013**			
	A general overview of the policy document	Gives a detailed account of Blue carbon Ecosystems: Mangroves, Seagrass, a Coral reef	Focus mostly on tangible goods and services but not on climate change	Need for policy revision to detail climate change mitigations aspects of the BCEs and their contribution to the country NDC
14	**Fisheries management and development Act of 2016**			
	(2) The implementation of this Act shall be guided by the following principles (Pg 757)	Conservation and protection of fish habitats highlighted among the principles of fisheries management	The Act addresses the fish habitat issues but falls short of mentioning mangroves and seagrasses as important nursery habitats, on the other hand, the Forest Conservation and	It is important to mention these important BCEs in the Act as studies have demonstrated that there is relationship between coastal fisheries with the status of mangroves and seagrasses

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
			management Act2016 mentions the conservation of mangroves for their function as nurseries for fish	Seagrasses are not mentioned in any of these two Acts. Their function as nurseries as well as fishing sites justifies their mention
	PART X — LICENSING AND REGISTRATION (Pg 113-123)	Detailed requirements for aquaculture licenses given	In coastal areas, pond culture takes place in mangrove areas that are not under SDF&BE	Elaborate on the kind of licenses needed for coastal aquaculture in mangrove areas and spell out the agreements between SDF&BE and Kenya Forest Service
15	**The Wildlife Conservation and Management Act, 2013 No. 47 of 2013**			
	32 (2) Pg. 1270	A marine protected area shall adopt a system of zoning that caters for multiple uses of marine resources for any or all of the following: (a) Extraction or no extraction zones in respect of marine resources; (b) Protection of nesting, breeding and foraging areas; (c) No-take areas in respect of fisheries; and (d) Areas that may be used by local vessels for passage; (e) Any other purposes concerning specified human activities within the zone.	Although not specifically specified the Act provides for the conservation and sustainable utilization of BCEs within the marine protected area. This, specifically no-take areas allows for continued sequestration and storage of carbon thus supporting mitigation and adaptation efforts to combat the negative impacts of climate change	Need for an updated assessment of the status and condition of the BCEs, which will enhance their conservation and sustainable utilization.

No	Section (include page no)	The current situation on BCEs (mangroves, seagrasses)	Gaps/Issues	Recommendations
	36 (1) Pg. 1273	In consultation with relevant lead agencies, a marine area can be declared a marine conservation area where the area is- (a) Rich in biodiversity or harbors endangered and threatened marine species; or (b) A critical habitat for a variety of marine resources.	This provision protects BCEs that are endangered and threatened especially due to their role in carbon sequestration within the systems.	Intensify research on BCEs to guide on the importance of the increased marine conservation area and include other endangered BCEs species that may have been left out