

Framework for Mainstreaming Climate Change into African Blue Economy Strategies to Enhance Adaptation, Mitigation, and Resilience in Sustainable Development

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Abstract

This article outlines a framework for mainstreaming climate change into African blue economy Strategies. We underscore that the proliferation of the blue economy in climate change has gained momentum, however, there remains no standardized approach, mechanism or framework for mainstreaming and integrating climate change into blue economy. The economic pillars of economic development, social equity, and environmental management, conservation and sustainability are at the center of the blue economy frontier. The surrounding blue economy components have led to discrepancies in how the blue economy is mainstreamed, integrated, implemented and what is prioritized on agile basis. This article takes a continental overview of current approaches to regional and national levels of blue economy realignment. In doing so this article provides the continental, regional and national assessments of blue economy implementation approaches, through the development of a stepwise innovative process. Using the available literature, data and information from blue economy strategies and other publicly available online information, we analyzed each region and national blue economy strategies to assess the levels of blue economy components mainstreamed into climate change. Throughout this article we outline the methodological approach we took in order to develop a stepwise process innovation for mainstreaming climate change into blue economy at national and regional levels This approach will allow for ongoing and continued mainstreaming and integrating of climate change into blue economy realignment, operationalization and implementation as the concept of blue economy continues to evolve. The approach entails a collective action process for an informed decision making to

direct, guide and inform actions for climate change that will effectively and efficiently enhance adaptation, mitigation and resiliency anchored to sustainable development. It establishes linkages to blue economy strategies through an integrated approach. The article addresses the question “How does mainstreaming climate change into African blue economy strategies contribute to achieving sustainable development?” The methodology is based on desk-top study and literature review. This explores the process of mainstreaming, drawing on the countries and regional blue economy strategies, that have made progress in development of blue economy strategies, plans, guidelines and frameworks for governance coordination mechanism. In conclusion, the article states that mainstreaming climate change in Africa reflects a complex pathway of processes and stakeholders that need to be taken into consideration in further research, with particular focus on institutional policy change, administrative structures and transformation.

Keywords

Climate Change, Blue Economy, Adaptation, Mitigation, Resiliency

Key Policy Highlights

- There are significant knowledge and data gaps limiting mainstreaming of climate change into the blue economy and require policy support necessary to bridge climate change and the blue economy through building capacity to strengthen institutional abilities and human technical capabilities in Africa.
- The blue economy is emerging as a potential sector for development in Africa and is likely to generate environmental co-benefits for climate change and policy support is required by creating the enabling environment for private investment in climate change and the blue economy.
- Innovative processes are required for designing interventions necessary to mobilize private finance and investments for climate change and the blue economy with a clear understanding of the distinct roles of climate change, blue economy, finance and investment and other sources of capital for businesses and households driven by the blue economy.
- The incentives to mainstream climate change into the blue economy require investment and robust policy initiatives.
- International instruments, conventions and treaties continuously provide best practices for learning lessons on effective tools needed to mobilize finance for investments and require policy support to capture changes in the approaches used for mainstreaming climate change into the blue economy.

1. Introduction

The article explores how a framework for mainstreaming climate change into African blue economy strategies at the level of African Union Member Countries

and Regional Economic Communities (RECs) can contribute to sustainable development. However, emerging global issues in relation to Ukraine-Russia war conflict impact critical economic issues with implications on 55 AU Member Countries. 11 out of the 55 countries were visited during the preparation of the Africa Blue Economy Strategy (African Union, 2019). Four countries (Madagascar, Burkina Faso, Somali and Congo Republic) and three Regional Economic Communities (EAC, COMESA and ECCAS) were assisted by AU-IBAR to prepare their strategies and realign to the AU Africa Blue Economy Strategy. Realigning the strategies is important to operating the blue economy (Bolaky, 2020). The data available from these strategies is limited and lack information (Mariam, 2022) on mainstreaming climate change. The presentation of the article covers main-streaming climate change, methodology, analysis, and results with some conclusions.

Mainstreaming aspect is implied to mean that “adaptation, mitigation, and resiliency to climate change will be directly integrated into climate change actions when sustainable development planning, environmental management, ecosystem conservation and protection is undertaken (ECA, 2020; Galloway McLean, 2010). This action is in parallel with the articulation and formulation of sector policies required to achieve sustainable development (EU, 2022; Kok & de Con- ick, 2004). In this context, mainstreaming climate change adaptation, mitigation and resiliency implore other blue economy sector policies to enhance efficiency and effectiveness (Böhm & Dabhi, 2009). Thus far, some work has been done on blue economy with limited mainstreaming of climate change (Patil et al., 2016; Whitley et al., 2014). **Table 1** below shows some of the African countries with documented evidence of blue economy.

The information provided in the table above, provides a basis for reviewing, assessing and analyzing how climate change can be integrated and mainstreamed into the blue economy. Mainstreaming into blue economy is perceived as sectors that are integrated through designing, organizing, and evaluating progress from the perspective of climate change adaptation, mitigation, and resiliency (FAO, 2008; Hamilton & Akbar, 2010). This implies undertaking an assessment of how climate change impact on vulnerable communities with low capacity and how the sustainability of development roadmaps considering institutional accountability and responsibility to tackle climate change problem (Karani et al., 2022; Totten, 1999). Hence, mainstreaming implies involving all socioeconomic sectors, governments, private sector, civil society, industry, and local communities into the climate change blue economy process. The resulting outcome is the change in policy for climate change and blue economy orientation. **Figure 1** below stipulates how sectoral approach is applied to integrate and mainstream climate change into blue economy process.

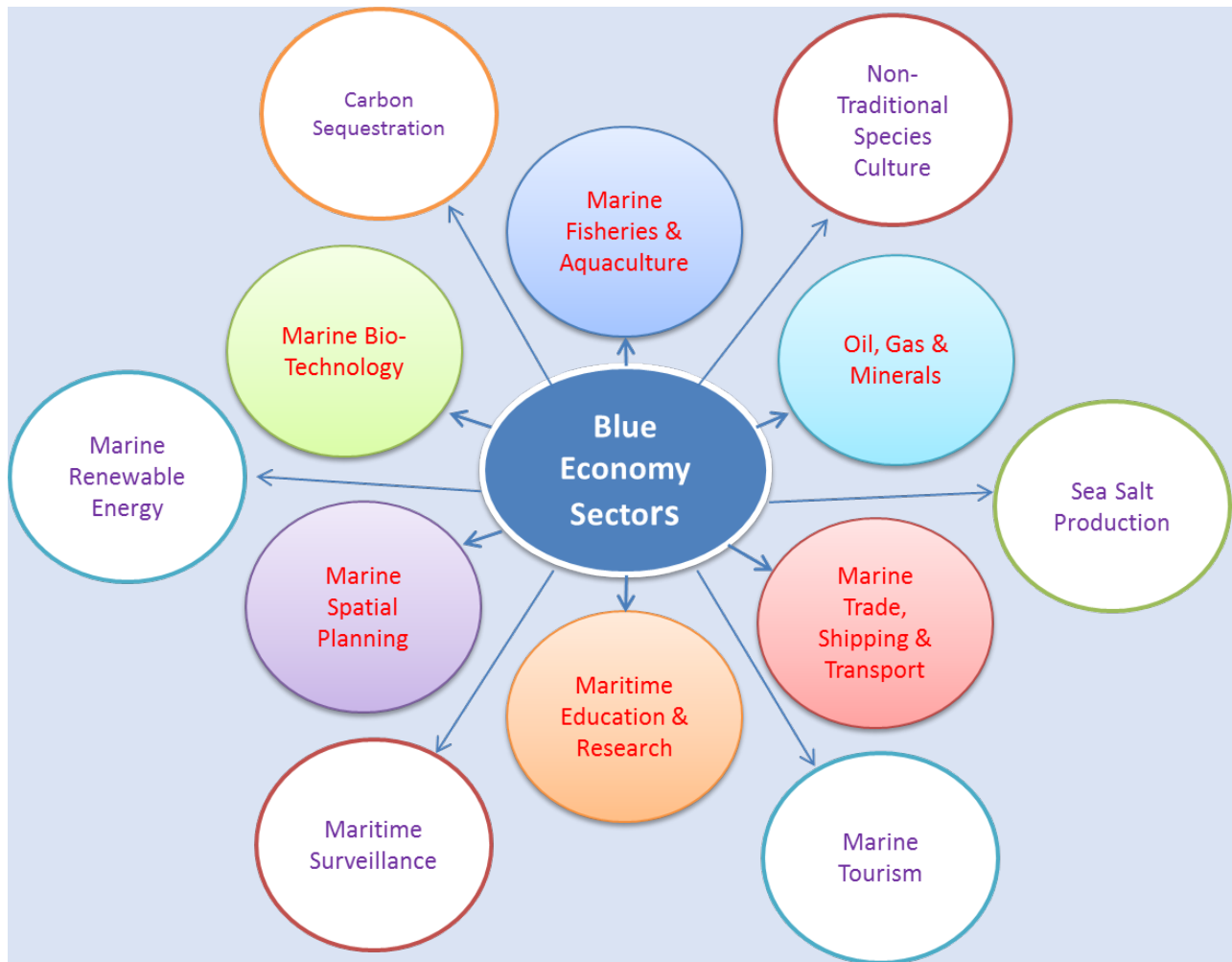
The key component of mainstreaming is the adequate awareness of decision-makers at all sector levels of blue economy that climate change impacts should be reduced, minimized, avoided, managed, and mitigated (Failler & Seisay, 2021,

2022; Palosuo, 2009). Exploring marine resources for economic activities fuels a backlash against environmental management, biodiversity conservation and coastal communities' livelihoods. Most coastal countries all over the world have used marine resources and blue economy for growing their economies.

Table 1. AU-Member States and REC implementing blue economy.

Countries	Documents
Madagascar	National Blue Economy Strategy 25 June 2022; building up on a National Blue Economy strategy prepared based on the Madagascar National Development Plan 2015-2019 that made reference to the Blue
Burkina Faso	National Blue Economy Strategy April 2022
Somali	National Blue Economy Strategy March 2022
Congo Republic	National Blue Economy Strategy 28 June 2022
Seychelles	National Blue Economy Strategy: Republic of Seychelles (2018). Seychelles Blue Economy: Strategic Policy Framework and Roadmap Charting the future (2018-2030)
Mozambique	Mozambique Policy and Strategy of the Sea (POLMAR) developed in 2017 to serve many initiatives related to the Blue Economy
Mauritius	The Mauritius 3-Year Strategic Plan 2017/18-2019/20 lists the Ocean-based activities as having the potential to boost growth and create wealth. The Ministry of Blue Economy, Marine Resources, Fisheries and Shipping has a Five-year Fishery Development Plan and a National Action Plan to prevent, deter and eliminate illegal, unreported, and unregulated fishing and an aquaculture masterplan
South Africa	Ocean economy operation Phakisa-South Africa Blue Economy Strategy launched in 2014
Comoros	Strategic Framework for a Blue Economy National Policy with focus on: 1) Strengthening of national safety and security; 2) Enhancing key sectors of Blue Economy with training and creating jobs for the youth; 3) Protecting coastal. Aquatic, and marine ecosystems with managing the waste; 4) enhancing adaptation of institutional frameworks; 5) Reorienting pillars of regional integration frameworks
Regional Economic Communities (RECs)	Documents
East African Community (EAC)	Regional Blue Economy Strategy May 2022
Common Market for Eastern and Southern Africa (COMESA)	Regional Blue Economy Strategy May 2022
Economic Community for Central African States (ECCAS)	Regional Blue Economy Strategy 28 June 2022
Intergovernmental Authority on Development (IGAD)	Regional Blue Economy Strategy (2021-2025) Five Year Plan
Southern Africa Development Community (SADC)	Regional Blue Economy Strategy

Source: Karani, Failler, Gilau, Ndende, & Diop (2022).



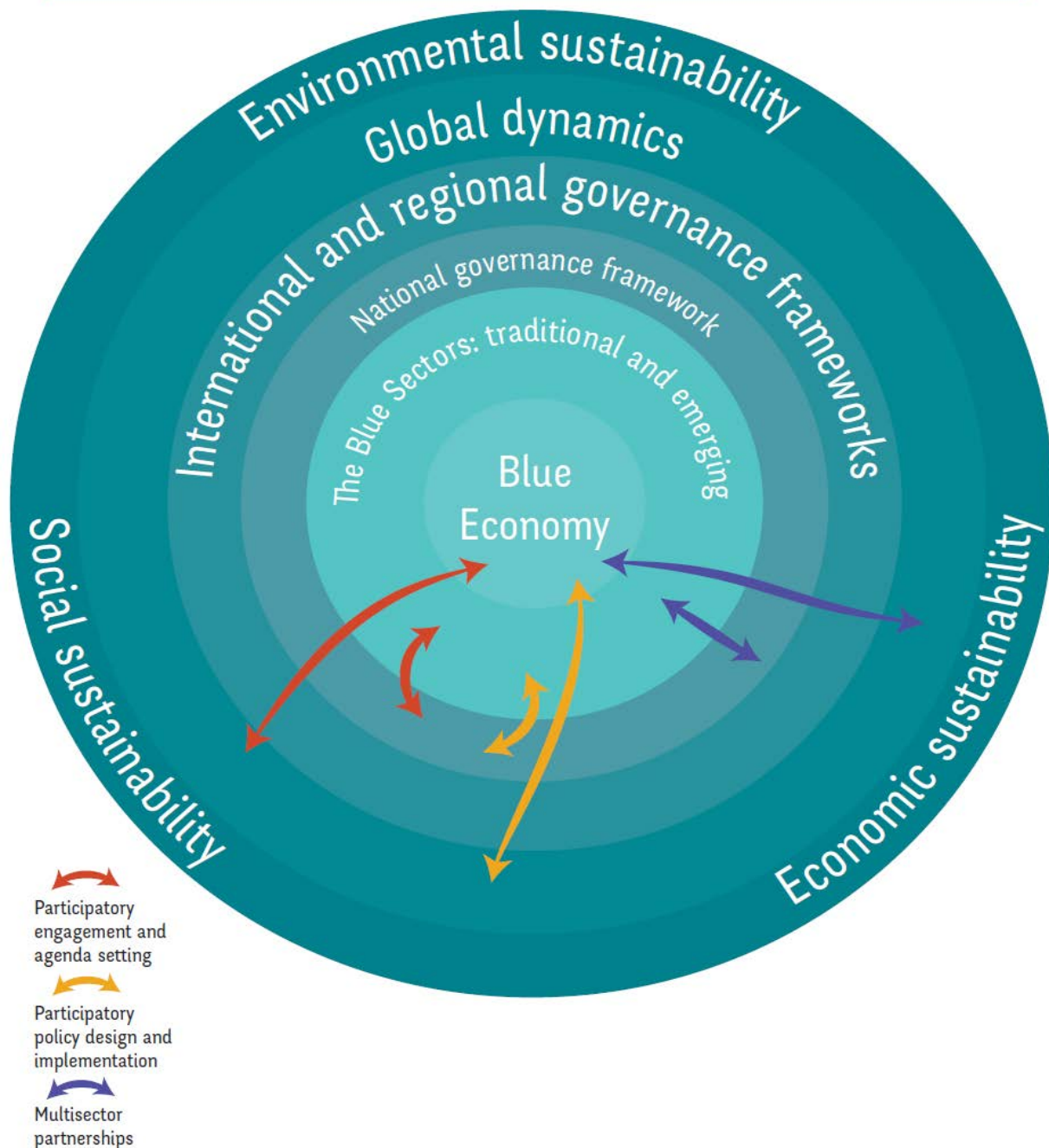
Source: (Failler & Seisay, 2021; AU-IBAR, 2019).

Figure 1. Mainstreaming Climate Change into Blue Economy. The chart below shows diversity of blue economy across economic sectors. Each one of the sectors emanates from blue natural resources, assets and capital with high concentration on marine based resources. Exploitation of the marine resources for economic opportunities makes economies more diversified and hence more resilient. Hence the need to create awareness on blue economy sectors for strategic interventions.

Africa Blue Economy Strategy (<https://www.au-ibar.org/>) highlights marine resources for sustainable development and resilience as compounded in Fisheries, aquaculture, conservation and sustainable aquatic ecosystems; Shipping/ transportation, trade, ports, maritime security, safety and enforcement; Coastal and maritime tourism, climate change, resilience, environment, infrastructure; Sustainable energy and mineral resources and innovative industries; and, Policies, institutional and governance, employment, job creation and poverty eradication, innovative financing.

The blue economy sectors foster international integration and, in several cases, embrace protectionist or nationalist policies. Blue economy requires policy change and institutional transformation necessary to safeguard marine resources for national interests. Blue economy plays a key role in provisions of many other initiatives equivalent to derived and associated products including Blue Growth.

THE DESIRABLE BLUE ECONOMY FRAMEWORK



Source: (Failler & Seisay, 2021; AU-IBAR, 2019; Failler, 2022a).

Figure 2. Potential Framework for Blue Economy. Blue economy as evolved as a concept building up from green economy embraced in environment, social and economic sustainability. The desirable blue economy spans across micro to macro levels at traditional, national, regional and international frameworks. In this regard, by definition, Blue Economy: includes a variety of activities ranging from fisheries and aquaculture; and ecosystem services such as carbon sequestration, coastal protection and biodiversity. The ecosystem plays a major role in climate change mitigation and adaptation through absorption of carbon dioxide (CO₂), coastal habitats such as mangrove forests, sea grass beds sequester carbon and help to protect coastlines, prevent soil erosion from floods and storms (World Bank, 2015, 2017, 2021).

Ocean economy; Ocean Governance; Blue Governance; Blue Carbon; Blue Guardians; Blue Finance; Blue Bonds; and Blue Belt among others.

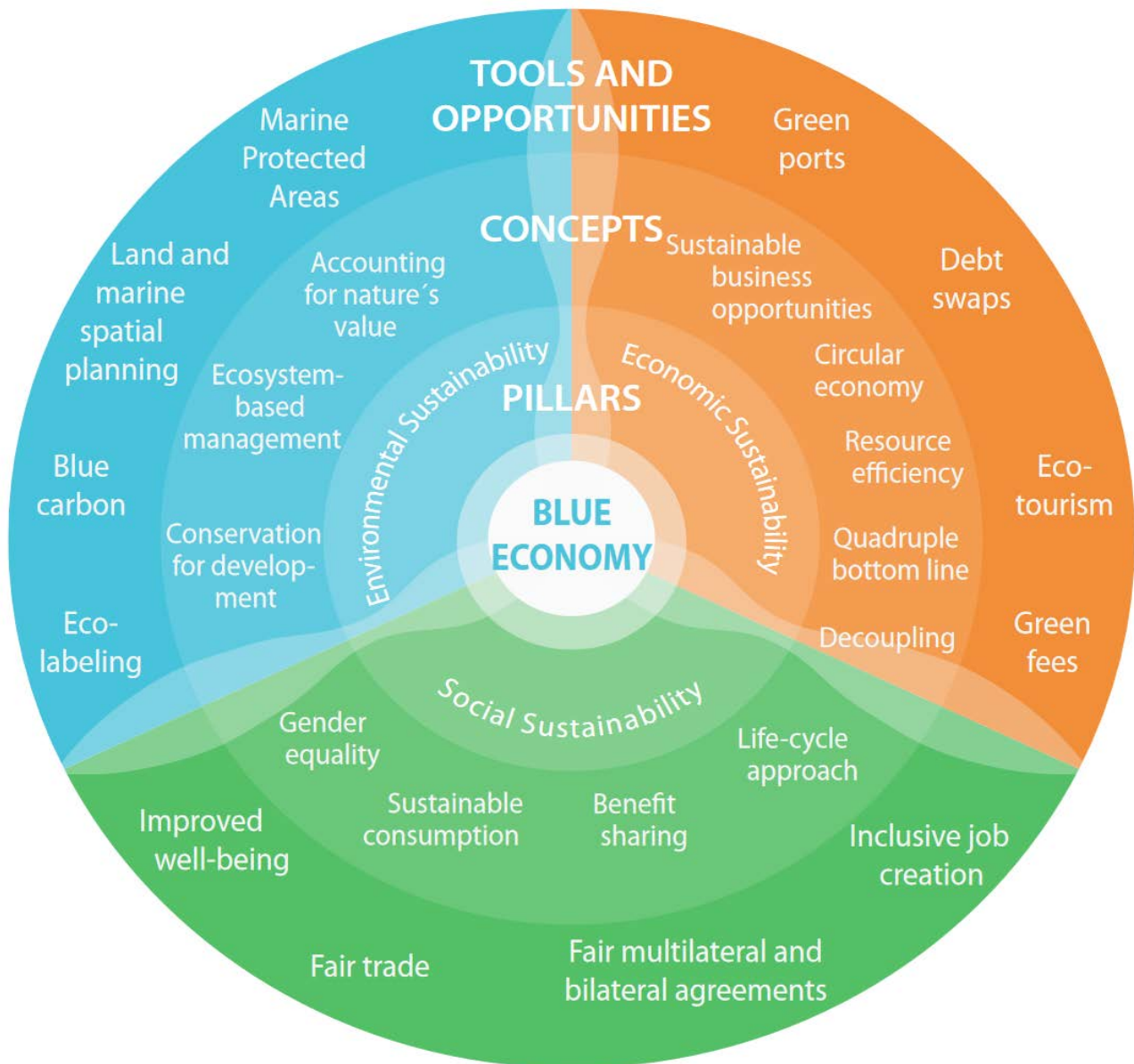
Each one of the derivatives and or products from the marine resources have economic value with significance for economic opportunity. The derivatives bring together different stakeholders, such as industry, government, conservation, and recreation and communities among others. This approach of togetherness is agile and based on priorities of sustainable development and resilience that enable stakeholders to jointly make decisions about how to allocate marine resources among competing economic activities while protecting marine eco-systems. The approach works across sectors and national borders to encourage investments, creates more transparent rules and a more predictable investment climate. This aims to ensure that human activities at sea and ocean do not jeopardise the eco-system health of oceans and seas. Hence, informed decisions and policy are facilitated by technological innovations required to empower informed decisions, as blue economy may rely on technological innovations that deliver reliable and relevant data that is evidence based.

Hence, information on potential impacts of climate change needs to be available for articulation and formulation of blue economy sector policies that will enable decision-makers to be aware of sustainable development, economic opportunities, and requirements for stakeholders' engagement in the designing and implementing the policy instruments (Failler & Seisay, 2021; Jindal & Namirembe, 2012).

Effective exploitation of blue economy requires efficient governance. Blue governance refers to reform of policies, building public sector capacity, aligning economic interests with long-term sustainability, and promoting conditions that encourage business growth in a sustainable seafood sector. Public-private dialogue, stakeholder inclusion and strategic partnerships with donors, technical expertise, the private sector and clients help shape the fisheries agenda and position fisheries as central to today's development challenges, poverty alleviation, climate change, and food security.

The policy instruments establish linkages between climate change adaptation, mitigation, resiliency, and sustainable development. These linkages make it necessary for addressing the issues of mainstreaming climate change into blue economy in an integrated approach (Failler, 2022a; Failler et al., 2020a, 2020b). For example, **Figure 3** below, shows the dynamics using blue economy in both theory and practice as the epicenter of how several linkages can be established at sectoral levels, mainstreamed with climate change integration, and anchored to blue economy. In this context, the blue economy becomes the springboard (Failler, 2022a; Failler et al., 2020a, 2020b) to enable policy adjustments targeting adaptation, mitigation and resilience to climate change. Attention is paid to adjustment of policy frameworks suitable to institutional conditions that operate with economic effects (UNECA, 2021).

AU Member States in need of support for adaptation, mitigation and resiliency



Source: (Failler et al., 2020a; UNECA, 2021; UNEP et al., 2012).

Figure 3. Blue economy in theory and practice.

measures are those countries with inadequate capacity, low financial resources, weak institutional abilities, less technological and human capabilities (UNECA, 2016a; UNEP et al., 2012). These countries have the poorest people that are most vulnerable to effects of climate change (UNEP et al., 2012) Drought, floods, storms, earthquakes, hurricanes, disasters, unsustainability including low incomes, lack of jobs and other social, environmental and climate change stresses impact livelihoods (UNFCCC, 1992). Institutional and human capabilities are critical to providing solutions (IPCC, 2022). The linkages to research establish how pillars of blue economy connect to the conceptual frameworks with strategic interventions through application of tools and guidelines necessary for ex-

ploring economic opportunities for institutional change and social transformation (FAO). The linkages require integrated approach to “mainstream” climate change into Blue Economy in relation to development planning and sustainable development (Failler, 2022a; Failler et al., 2020a). Blue economy activities (Failler et al., 2020a; UNECA, 2021; UNECA, 2016b) support communities to offset climate change effects. Policy instruments to target adaptation, mitigation, resiliency and development strategies (Hudson, 2022; Huq et al., 2008; Burgess et al., 2018; Lu et al., 2019).

Therefore, sustainable process innovation is perceived as effective and efficient framework for advancing blue economy in sustainable development (Lu et al., 2019; World Bank, 2015). Mainstreaming climate change into blue economy in practice, is essential to application of international best practices to continental, regional and national levels (Keen et al., 2018; UNECA, 2012). International organizations, industrialized countries and developing country planners, are internalizing, and applying best practices (IPCC, 2022; Lu et al., 2019; UNECA, 2021; WCED, 1987). This article explores the process of mainstreaming climate change based on the national and regional blue economy strategies. Offsets, mitigation, resiliency backdrop against policy in Africa for mainstreaming climate change into blue economy (WCED, 1987; Failler et al., 2020a).

Implementation of blue economy strategies in Africa is still on sectoral basis (Suarez, 2020). Key sectors relevant to achieving climate change benefits through adaptation, mitigation and resiliency include energy, extractive industries, waste management through reduction and abatement measures of greenhouse gas emissions. While forestry, land management and water through enhanced carbon storage, sequestration and absorption. Deployment of clean technologies and building capacity is essential to enhancing resiliency of blue economy. In this regard, implementation of blue economy strategies, integrally captures the relevant Africa blue economy components that include activities, implementation timelines, intended outputs, mean of verification and actors at continental, regional and national levels. Climate actions through mitigation efforts lower or remove greenhouse gas emissions from the atmosphere, and adaptation efforts adjust systems and societies to withstand the impacts of climate change. Addressing climate change means pursuing *either* mitigation *or* adaptation. This divide is counterproductive especially for coastal villages, farmers, small island nations and other communities at the frontlines of climate impacts. Technologies that both curb climate change and cope with its impacts contribute to resiliency. However, it is not possible or practical to work entirely on actions that are both adaptive and mitigating. Actions make sense when governments and communities pursue such actions for implementation. In the context of blue economy, table below provides some suggestions that can both curb climate change and help humanity cope with its impacts.

The blue economy has potential to curb climate change. It is a potential carbon.

Table 2. Suggestions to curb climate change impact.

SN.	Sectors	Actions	Sources
1	Coastal Wetlands	Blue economy significantly benefits from salt marshes, mangroves and seagrasses that are unique coastal ecosystems that serve as natural water filtration systems and marine habitats. They defend coasts against sea level rise by buffering storm surges and floodwaters, and store tons of carbon in their roots and soils. Mangrove forests hold the equivalent of more than two years of global emissions, which would be released into the atmosphere and worsen the effects of climate change if these forests are destroyed. Increasing protected coastal wetlands and recovering about 40% of the ecosystem's global coverage by 2050 could mitigate one gigaton of CO ₂ per year -over three years of emissions. Efforts to maintain coastal wetlands must include local communities that rely on these ecosystems for their homes and livelihoods. AU Member States utilizing blue economy strategies can apply community-based conservation and education to manage these wetlands and support the development of surrounding communities.	(Hudson, 2022) A Sustainable Ocean Economic Paradigm. UNDP. (Totten, 1999) Getting it Right: Emerging Markets for Storing Carbon in Forests. World Resources Institute
2	Sustainable Agroforestry	Land management in the context of blue economy provide space for controlling and minimizing run-offs, erosion and improving water catchment, quantity and quality. With land use changes from forestry and agriculture accounting for nearly 25% of human made greenhouse gas emissions, it's clear that current land management schemes need to change. Agroforestry practices integrate diverse trees or shrubs with crops and livestock. Pastures with trees can sequester 5 - 10 times more carbon than treeless areas of the same size. Farmers can also be more productive by growing crops and raising livestock simultaneously using significantly less land. Diversifying crops and including livestock on these lands that can give farmers additional sources of income and reduce the risks to livelihoods caused by climate change and unpredictable weather. Expanding the use of this method to 554 million acres globally, estimated to require an investment of \$41.6 billion, could help farmers obtain \$699 billion in financial streams from diversified revenue.	(IPCC, 2022) World Commission for Sustainable Development (WCED, 1987) (UNDP, 2012) The Future we Want: Biodiversity and Ecosystems Driving Sustainable Development: Biodiversity and Ecosystems Global Framework
3	Decentralized Energy Distribution	Climate variability will negatively impact countries' electricity transmission and distribution infrastructure. At the same time, development and population growth are increasing energy demand and usage. Centralized energy systems—with large power plants and infrastructure connected over long distances—are more vulnerable to climate change since disruptions at one point in the system can affect the entire network. Decentralized systems—often powered by renewable energy, with shorter transmission lines and smaller distribution areas—are more climate-resilient. In the event of a disaster, a community with its own decentralized energy supply isn't affected by power outages in other areas. Smaller, more manageable power sources can also recover from disasters more rapidly. Low-carbon technologies such as solar panels and batteries can also provide reliable, clean energy to critical services, like hospitals in remote areas that aren't already connected to the grid or experience frequent power outages.	(Bhandary, Gallagher, Jaffe, Myslikova, Zhang, Petrova, Barrionuevo, Fontaine, Fuentes, Karani, Martinez, Seithheko, Staicu, Ullah, & Yimere, 2022) Demanding development: The political economy of climate finance and overseas investments from China. Energy Research & Social Sciences. www.elsevier.com/locate/erss

Continued

4	Land Management	Indigenous and local communities manage about 50% of on the planet, which up to 2.5 billion people depend on for their livelihoods. These communities have practiced adaptation principles on their lands over generations, developing a deep body of traditional knowledge that can help others understand how to adapt to a changing environment. What's more, places where indigenous people have legal rights to their land have at least two times lower deforestation rates than similar areas without secure tenure. Indigenous people and local communities have protected forests that hold of all above-ground carbon in tropical forests. Yet these communities legally own less than one fifth of this land. Securing indigenous peoples' rights will ensure they can hold onto their land, protect natural resources and better sustain their livelihoods in the face of climate change.	(Galloway McLean, 2010): Advanced Guard: Climate Change Impacts, Adaptation, Mitigation, and Indigenous Peoples—A Compendium of Case Studies. United Nations University. Traditional Knowledge Initiative
5	Transport	Road transport accounts for 72% of global transportation related emissions, a percentage which will continue to grow unless more low-carbon transportation options become available and accessible. Transportation infrastructure is also extremely vulnerable to climate change impacts like storms and extreme heat. Disruptions to the network due to extreme weather will disproportionately affect low-income people and other vulnerable urban populations who have fewer mobility options. Resilient, low-carbon mass transit addresses both challenges. Expanding urban public transportation by 40% by 2050 could decrease the projected number of cars on the road and avoid 6.6 gigatons of carbon emissions. Retrofitting and designing mass transit to withstand climate risks such as natural disasters, sea level rise or extreme heat ensures these transport options are safe and reliable in the long-term. These improvements can influence usage and better accommodate future growth. Some cities like San Jose, Costa Rica, Rome, Buenos Aires among others, have integrated additional adaptation measures like heat-proofing buses and greening stops and routes to improve the commute experience. Increased public transportation also has the added benefits of relieving traffic congestion, reducing accidents and fatalities, and improving air quality	(African Development Bank, 2018) African Economic Outlook. (Ten Brink et al., 2015) Nature and its Role in the Transition to a Green Economy. (World Bank, 2015, 2017, 2021) Africa Development Indicators.

Source: Adopted and modified by (Suarez, 2020): Strategies to Achieve Climate Adaptation and Mitigation; (UNEP, 2012): Rio + 20.

sink with capacity and ability to absorb carbon dioxide from the atmosphere and reduce greenhouse gases that contribute to global warming. In addition, its economic contribution is subject to balance of payments based on import-export model, that generates deficit or surplus in an economy. The offsets between deficit and surplus would result in resilience of an economy as blue economy takes more diversity in sectors and hence becoming more resilient. The resiliency is likely to boost blue economy growth (Seychelles Blue Bond applied in Debt for Nature Swap to manage Marine Protected Areas and boost blue economy growth). But, considering blue economy in Exclusive Economic Zones (EEZ) and Areas beyond National Jurisdiction Boundaries (ABNJB) require supporting tools not limited to Marine Protected Areas (MPAs), Marine Spatial Planning (MSP), Marine Control Surveillance (MCS), ocean accounting, natural capital, and valua-

tion that will continue to further explore marine resources. However, blue economy growth cannot be sustained without reference to specific blue economy derivatives and associated products. Exploitation of blue economy resources among countries may result in sustainable development and imply greater resilience to oceans. It may, however, lead to less resilience to other types of ocean resources, such as the endangered species, hotspots, fragile marine ecosystems and wetlands.

Increasing exploitation of blue economy among countries, may generate inequality that could increase and result into unsustainable development. Exploitation barriers lead to higher prices, which mean lower real wages. Blue economy may have contributed to more spatial inequality, but protectionism is not the cure, it will likely make the problem worse. Across countries, there is a risk of increased economic inequality. Geographical economic fragmentation could lead to more blue economy trade between high-income economies that are trading partners. Increasing emphasis on environmental and labour standards in economic agreements would raise entry barriers for very poor countries that find it difficult to meet these requirements. Without access to lucrative foreign markets, there is no clear path for poverty reduction and development in such economies (Goldberg & Reed, 2023).

2. Methodology

The methodology is based on criteria of realigning national and regional blue economy strategies to the African Union Blue Economy Strategy. Now there is no standard, consistent and comparable approach to assessing and analyzing blue economy in the context of climate change. In this regard, the paper uses a methodology that enables the assessment and analysis of blue economy strategies at national, regional and continental levels. The methodology allows the review of the literature that helps in understanding the ways in which the blue economy has been mainstreamed at national, regional and continental levels reflecting on trends of economic activities that are becoming significant as blue economy continues to grow and the pressure on marine resources becoming more apparent (IPCC, 2022). Our paper contributes to this analogy by providing continental, regional and national review of blue economy strategies underpinning a Framework for Mainstreaming Climate Change into African Blue Economy Strategies to enhance adaptation, mitigation, and resilience in sustainable development. Voyer et al. (2018) applied a methodology based on institutionalization of blue economy in Commonwealth member countries to enhance the understanding of mainstreaming blue economy but did not establish linkages to climate change. Their methodology was limited to blue economy operations, governance and priority sectors in alignment to the priority sectors in the Sustainable Development Goals (SDGs) and the Commonwealth Blue Charter.

Our paper focuses on a Framework for Mainstreaming Climate Change into African Blue Economy Strategies to enhance adaptation, mitigation, and resi-

lience in sustainable development (FAO, n.d.). This enables us to review the literature on blue economy sectors with a bias on sectoral approach. Cisneros-Montemayor, et al. (2021) applied global data to quantify and strategically map-out capacity of countries to develop a blue economy. The assessment was based on resource availability and enabling situations related to social equity (human rights and gender), environmental and economic sustainability including infrastructure and investment opportunities. Our paper leverages and compliments what has been done by looking at countries and regional economic communities that have developed blue economy strategies and if they have in any way attempted to mainstream climate change. Supplementary methodology on the classification of the Blue Economy Development Index by Adrianto et al. (2019) postulates our effort in the assessment and analysis of blue economy at different levels. The classification of blue economy recognizes the need to code, label, track, control, survey and monitor the use of marine resources to ensure sustainability aspects and assess the level of importance of blue economy in Exclusive Economic Zones and Areas Beyond National Jurisdiction Boundaries. The classification is measured through social and economic capital that involves gender inclusivity, social equity and economic sustainable growth. Adrianto (2022) alludes to this methodology to focus on employment rate, income distribution and the ocean economy based on marine resources. Our paper builds up on these methodologies but with focus on the level of African Union Member Countries engagement with blue economy strategies, policies, guidelines, action plans. In all, incorporating the blue economy pillars related to environmental, social and economic sustainability.

2.1. Data Review

Data review dwelt on Africa Blue Economy Strategy (ABES) 2019 (Failler & Seisay, 2021), AU Africa Blue Economy Implementation Plan 2021-2025 (Failler, 2020a), Governance and Coordination Mechanism Framework of the AU Africa Blue Economy Strategy 2020 (Failler, Karani, Gilau, Hamukuaya, & Diop, 2020a). The data review was supplemented by blue economy studies from East African Community (Fulanda, 2022), Economic Commission for Central African States-ECCAS (Ndende, 2022a, 2022b), Common Markets for Eastern and Southern Africa-COMESA (Hamukuaya, 2022), and Intergovernmental Authority on Development (IGAD) 5-year Blue Economy strategy-IGAD, 2021-2025 (Failler, 2022a; EU & IGAD, 2020). Additional review included national blue economy studies of Madagascar (Failler, 2022b); Burkina Faso (Diop, 2022), Republic of Congo (Ndende, 2022a, 2022b), Somalia 2022 (Gilau, 2022), Seychelles (Commonwealth Secretariat, 2018), Mozambique (Nairobi Convention, 2017), Mauritius 2017/2018-2019/2020 (Government of Mauritius, 2020), South Africa (Government of South Africa, 2014); Government of Comoros (2020) and working papers on blue accounting in the context of African Union Blue Economy Strategy (AU-IBAR, 2019; Failler, Karani, Gilau, Hamukuaya, & Diop, 2020a);

and coastal and marine spatial planning towards supporting implementation of the Africa Blue Economy Strategy AU-IBAR, January 2022, and online literature review.

African Blue Economy Strategy 2019 assessed 11 out of 55 AU-Member Countries, and four Regional Economic Communities (RECs). National blue economy studies focused on institutions identified as focal points by directors of fisheries, aquaculture, environment, climate change and blue economy. Qualitative techniques for focused group and individual discussions, and questionnaires were applied to obtain data. The response rate was low because of inadequate awareness and limited information on blue economy. Constraints in time, finance and limited physical interactions, paved way for telephone interviews. Data gathered was complemented by secondary data. Overall, methodology was based on: Identifying AU Member Countries and RECs designing and implementing blue economy strategies, policies, plans, guidelines, and frameworks; gathering data on blue economy in AU Member Countries and RECs; and analyzing data on blue economy and climate change.

2.2. Approach with Strategic Framework for Mainstreaming Climate Change into Blue Economy

On the development plans, activities attributed to mainstreaming climate change into blue economy are based on integration aspects. The approach determines innovative process of mainstreaming through assessment as the strengths of this approach.

The mainstreaming of climate change into blue economy with respect to adaptation, mitigation and resiliency is based on development planning. This is the cornerstone of budgetary provisions for national and regional institutions essential to blue economy sectors (Government of Mauritius, 2020) Integration of blue economy into climate change, provides linkages within UNFCCC and Paris Agreement (United Nations, 2012; UNEP, 2012). Article 4.1 of UNFCCC supports main-streaming climate change into development planning (UNFCCC, 1992) While Article 6 of the Paris Agreement calls for robust market systems to implementing Nationally Determined Contributions (NDCs). NDCs reduce greenhouse gas emissions (GHGs) and promote low-carbon economy growth and development (IPCC, 2022). Mainstreaming is key to development planning processes (UNFCCC-NAPAS) supported by several guidelines on adaptation, mitigation, and resiliency guiding development practitioners and not planners. Some of the guidelines mainstreamed National Adaptation Programmes of Actions (NAPAs) into national development planning (Government of South Africa, 2014; Government of Comoros, 2020). These guidelines were limited to public access. Hence, most Member Countries who lack financial resources, constrained by institutional ability, and inadequate technical capability failed to mainstream NAPAs. Limited mainstreaming of NAPAs into planning, constraints the approach to mainstreaming climate change into blue economy

(Ahmed, & Thompson, 2019). There are hardly best practices and lessons on how mainstreaming of NAPAs into planning was satisfactory and successful. In this context, the proposed approach for mainstreaming climate change into blue economy attempts to combine theory and practice in possible scenarios (Nyoni, 2021; Patil et al., 2016).

The approach in the framework in **Figure 4** above, raises institutional and technical aspects relevant to mainstreaming climate change into blue economy sectors (Nyoni, 2021; EU & IGAD 2020). This is to inform policy and decision makers and to generate incentives necessary to incorporate the practical best practices and lessons learned into policy and planning (Lee et al., 2020; Silver, 2015).

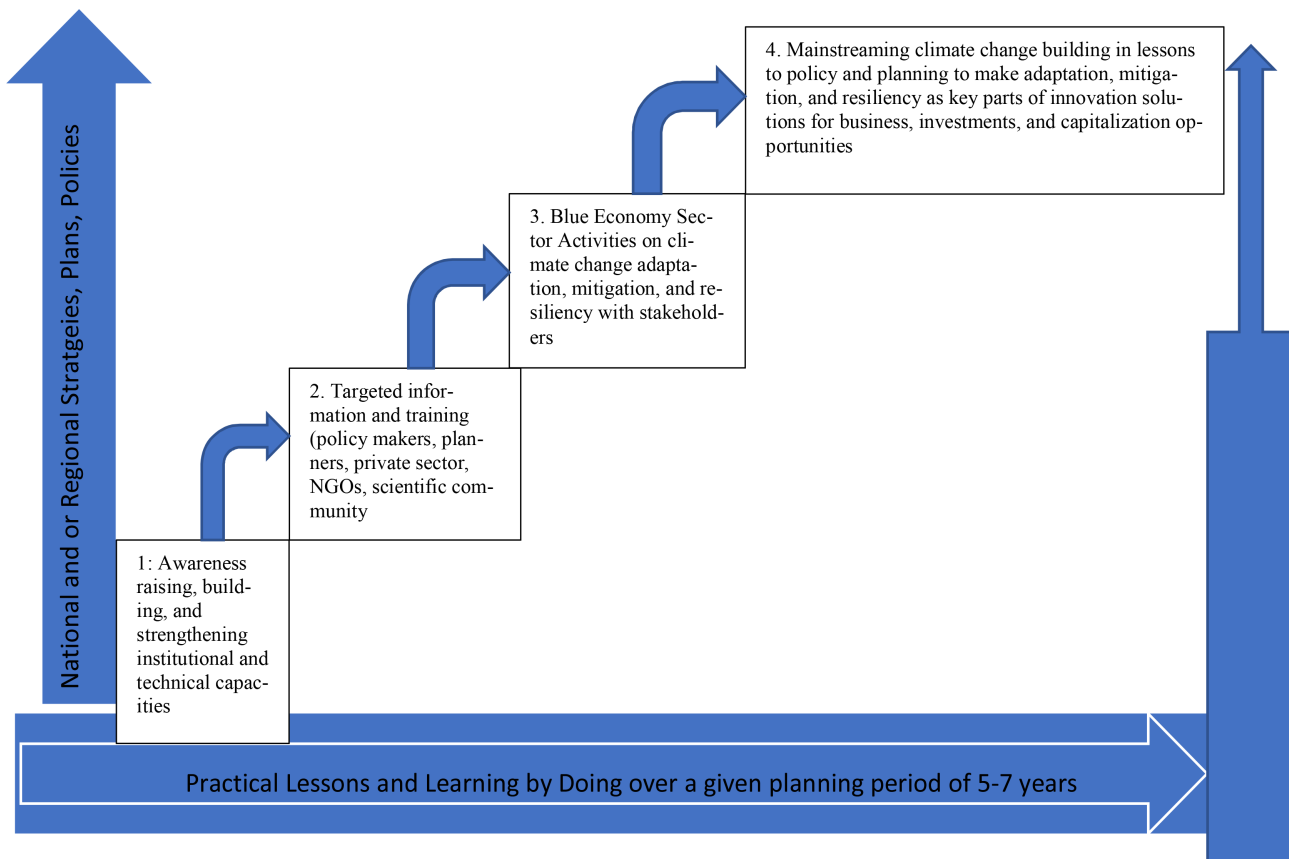
The first step (1) in the approach framework sensitizes and catalyzes climate change adaptation, mitigation, and resiliency. It is a key step for policy and decision-makers adopting climate change adaptation, mitigating risks of climate, and adjusting to effects of climate change as a development priority (Kumar, 2021). The policy and decision-makers are required to mainstream climate change into blue economy sectors (Lee et al., 2020; Richmond et al., 2021; UNDP, 2018).

Policy for climate change should be a process of mainstreaming aspects linked to blue economy sectors (Voyer et al., 2018). Highlighting “climate change problems” is not useful for policymaking. But establishing that the effects of climate change problems to blue economy growth and development, impact the social transformation. Therefore, the policy evidence needs to demonstrate relevant, realistic, solutions through practical approaches. In this regard, information is generated in country and at regional level.

However, this process is unpredictable and occur on incidences as stipulated by Intergovernmental Panel on Climate Change (IPCC, 2022). The regional levels policy catalyzes interest of the national, subnational, and regional platforms. Regional climate adaptation, mitigation and resiliency are key pillars for mainstreaming, integrating, and fostering ownership by Member Countries and regional institutions.

The second, the blue economy institutional organs are inevitable in planning. In this approach stated in **Figure 4** above, revolves on the needs to adequately catalyze interests of another challenge of research institutions and public policy research institutes on climate change useful to policymaking and development planning processes (Okafor-Yarwood et al., 2020; Babb, 2015).

The third, adaptation responses, mitigation measures and resiliency actions, lack information on approaches of how climate change adaptation, mitigation and resiliency do not result in long term capacity building necessary for achieving sustainable development (Babb, 2015; Cisneros-Montemayor et al., 2021). Innovative approach to mainstream adaptation, mitigation, and resiliency, is practical outcome, rather than a process. Adaptation, mitigation, and resiliency are “processes” involving building adaptive, management and adjustment capacity by creating the enabling conditions for planning (Nyoni, 2021). It is proven regions mitigation through mainstreaming and integration.



Source: Adapted with modifications: (Hudson, 2022; Huq et al., 2008).

Figure 4. Stepwise Innovative Process. The stairs shown in a stepwise manner in the chart below show the level of difficulty applied in mainstreaming climate change into blue economy. The process starts from the basic level of awareness raising requiring mobilization and outreach to stakeholders through a level of identification of target audience and information related to assessment and analysis of blue economy sectors and correlation to the mainstreaming aspects. Throughout the process, the information and data is extracted from tools related to strategies, plans, guidelines and policies shown in the vertical axis. The tools are practically informed by lessons and practices evidenced in a period of 5 - 7 years as shown in the horizontal axis. The stakeholders involved in the process are heterogeneous and complex with different level of understanding the tools as presented. Ultimately, the impact is on the most vulnerable stakeholders to effects of climate change and lacking technical skills, limited in financial and technological resources. The limitations constraint efforts to mainstream climate change into blue economy. In essence, the blue economy embraces climate mitigation, adaptation, and resilience, and the inclusion of the blue economy in Nationally Determined Contributions (NDCs). The stepwise process discussion is on the scale for investment, sustainable value chains, Research and Development (R&D) and innovation into investment in the developing, emerging or recently emerged areas including in deep sea research, mining, extractive industries in oil and gas.

The fourth, adaptation, mitigation and resiliency articulation and formulation in blue economy are necessary processes. The processes require paradigm turning point from 'business as usual' to financing business, capitalizing blue economy, building capacity for resiliency for the climate vulnerability (AU, 2022; African Development Bank, 2018). In the process, government stakeholders become fully engaged in adaptation, mitigation, and resiliency planning. The process is beyond environmentally focused institutions but targeting adaptation, mitigation, and resiliency planning for budgetary provisions and support (UNDP, 2012; Ten Brink et al., 2015).

The approach framework with stated four steps above in **Figure 4**, attempts to show-case how mainstreaming and integration of climate change adaptation, mitigation and resiliency is a process oriented. However, there is limited documented practice on mainstreaming and integration of climate change. This paper articulates the approach framework on process innovation basis and approach of integration through UNFCCC-NAPAs process. We draw on the blue economy strategies at continental, regional and country levels, which have taken strides at the national, subnational, regional, and continental levels in the context of mainstreaming and integrating adaptation, mitigation, and resiliency applied to blue economy experiences.

3. Analysis

The need for mainstreaming and integrating climate change adaptation, mitigation, and resiliency into blue economy through development planning in Africa, is a challenging process. Literature on blue economy is limited and sectoral in approach. Blue economy is emerging as a frontier for growth. In this regard, planning should factor in mainstreaming aspects. These include innovative approaches required to address climate change effects. African countries are most vulnerable to these effects of climate change due to lack of financial and technological capacity as well as institutional inability and human technical incapability and in addition to geographical landscape within the tropics and proximity to the Indian and Atlantic oceans and the Mediterranean Sea, that continuously experience effects of climate change.

The geographical landscape stipulates Africa's diversity. The abundance of natural resources both terrestrial and marine contain significant components of blue economy blue economy potential opportunities range across transport, food security, tourism, rural development and improved environmental sustainability Prospecting in biotechnology, innovative extractive industries, and ecosystem add more value to blue economy growth. Africa's blue economy contributes to 1) food and nutrition security from fisheries and aquaculture; 2) fisheries and aquaculture, marine and coastal tourism, shipping, mining, energy; 3) carbon sequestration, water filtration, atmospheric and temperature regulation, protection from erosion and extreme weather events. Mainstreaming and integrating climate change into Africa blue economy growth can be effectively stimulated through innovative processes.

Blue economy in African countries, is driven by fisheries, aquaculture, conservation and sustainable aquatic ecosystems. While other drivers are of service in nature. A few of the countries are exploring sustainable energy and mineral resources and innovative industries. Africa experiences challenges in relation to policies, and governance, job creation and poverty, and lack innovative financing. Therefore, analysis of the Africa blue economy strategies contributes to identifying whether climate change is being mainstreamed and integrated into the blue economy necessary for environmental conservation.

Africa's disasters and storms are likely to accelerate likelihood of severe climate change effects. Most African countries depend on fisheries for food. The small holder producers, informal processors and traders, are increasingly vulnerable to climate change, environmental and socio-economic shocks. The challenges African countries faced include inadequately responding to the impacts of concurrent crises of poverty, food insecurity, and low economic development.

The Africa disasters related to adaptation and adjustment are stipulated as contributors to "less developed continent". However, Africa's climate change affects natural resources that are climate sensitive. Agriculture is the mainstay of economy in Africa supporting most of the population while others rely on artisanal fisheries Africa, climate change adaptation, mitigation, and resiliency, need to be mainstreamed. Their effects are significant to development considering risks likely to impact sustainability.

4. Discussions

4.1. Mainstreaming Climate Change into Blue Economy in Africa

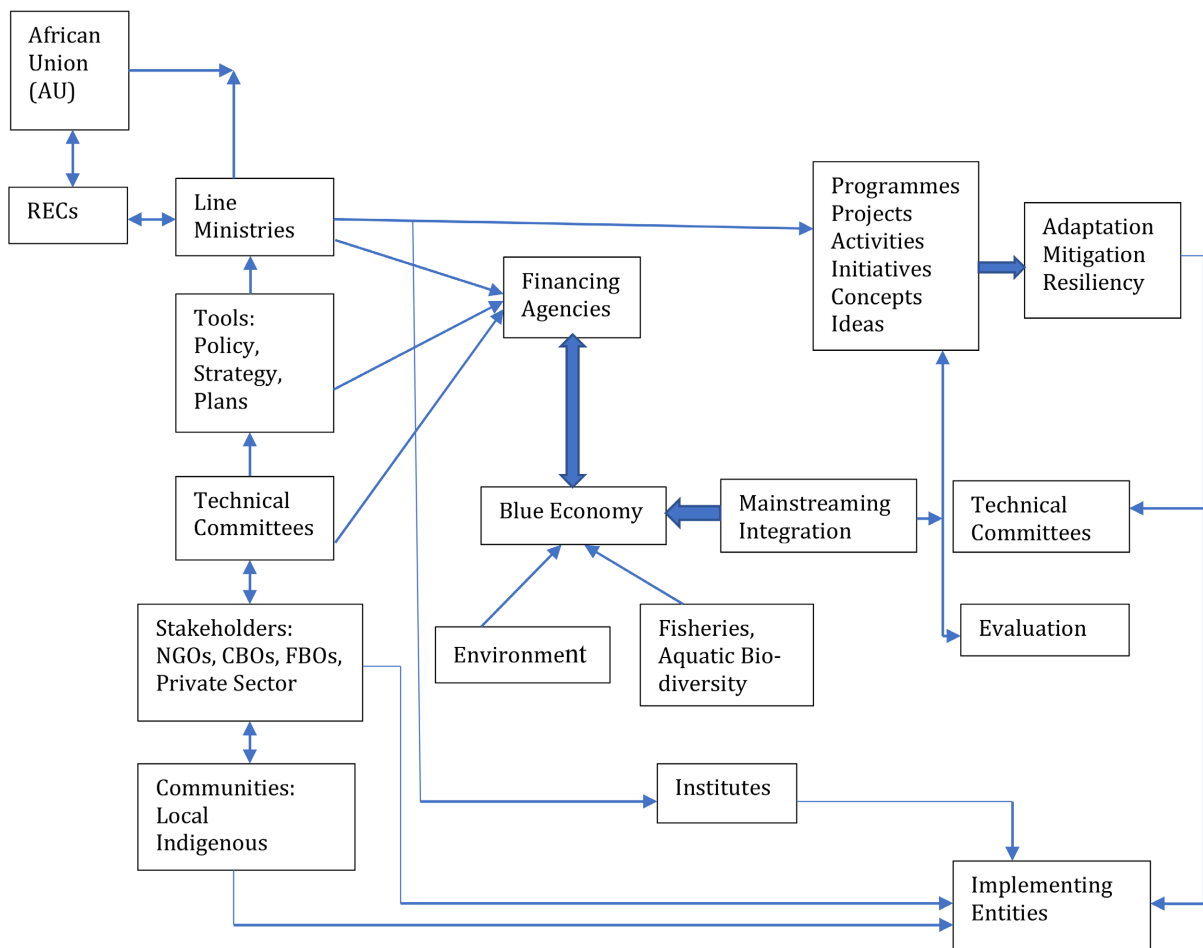
Africa has approached adaptation, mitigation, and resiliency for mainstreaming into blue economy. Adaptation, mitigation, and resiliency contributed to African countries developing National Adaptation Programmes of Action (NAPA) and Mitigation Strategies. The NAPAs and Mitigation Strategies including NDCs propose numerous projects that would contribute towards meeting Africa's adaptation needs and low carbon economic development through carbon offsets and carbon credits. Some of the projects have blue economy components. For example, blue economy sectors relating to mangroves and ecosystem management and conservation; deployment of renewable energy technologies; efficient transport and waste management; eco-tourism, carbon neutral, carbon sequestration, and enhanced carbon footprint. The blue economy is multisectoral requiring effective coordination among energy, transport, and innovative financial institutions.

Biodiversity Convention and The Paris Agreement on implementing Nationally Determined Contributions (NDCs) were launched. However, they lack reflection on blue economy integration. The emergency of SDG-12 (climate action) and 14 (life below water) and the United Nations Convention on Oceans and Seas (UNCOS) attempt to emphasize capacity building of the relevant stakeholders for adaptation, mitigation, and resiliency beyond climate options for broadening climate policy. Following up to these conventions, the African countries developed Climate Change Strategies and Action Plans for Climate Change Strategy and NDCs. The NDCs have been updated and now tagging into most African countries. NDCs are climate change strategies. To complement mainstreaming efforts, blue economy instigates to foster economic growth and prosperity. The mainstreaming of climate change into blue economy attempts to take into consideration inclusive development that is "pro-poor" and has potential to provide incentives for private sector investments. In this context, adaptation,

mitigation, and resiliency, including addressing mainstreaming pegs on the following pillars: Climate risk; and, Adaptation, Mitigation, Resiliency.

Fifty-four African countries have submitted NDCs with exception of Libya. In 2015, African Caribbean Pacific Center and Economic Commission for Africa (ECA) developed framework to develop INDCs after they were undertaken by African countries. Forestry stands out to attract academic research institutions, youth, women group aligning NDCs to UNFCCC. Include making the NDCs documents available to the public. The capacity building of institutions involved in NDCs provides potential opportunity for bridging the gaps necessary to enhance mainstreaming climate change into the blue economy. **Figure 5** below presents the institutional arrangements that support mainstreaming climate change into blue economy.

The Mainstreaming Framework is supported by climate change actions originating from existing conventions and best practices provided by institutional guidelines. The guidelines provide guidance on how climate change programmes, projects and activities can be funded to ensure that mainstreaming of adaptation, mitigation and resiliency is supported at the national and regional



Source: Authors construction.

Figure 5. Mainstreaming framework: Climate change into blue economy.

institutional arrangements. The Mainstreaming Framework takes into consideration the following:

A technical committee, tasked with mainstreaming climate change on adaptation, mitigation and resiliency for private sector, and local communities. Programmes, projects, and activities proposals that have potential to be integrated into the blue economy are considered for mainstreaming.

AU blue economy is at continental level with membership comprising of RECs and national governments with extension to the private sector and civil society. The technical committee makes recommendations to the national governments and RECs on policy, strategies, plans, which often then request further information and support from AU for implementation.

The AU is the focal organ providing coordination and technical leadership on blue economy and potential for mainstreaming climate change. AU led process is being rolled out to regional and national levels. AU is considering the mainstreaming of the climate change into blue economy. There are climate change initiatives including the recently completed Climate Action Plan (2022-2032). A Climate Change directorate under Sustainable Environment, and Blue Economy activities, focus on capacity building in 55 African Member Countries, nongovernment institutions, private sector and community based. Climate actions in some cases are led by civil society. All stakeholders play a key role in implementation of programmes, projects, and activities that tackle climate change problem.

Climate change adaptation, mitigation and resiliency is being integrated into general development planning in Africa. AU Climate Change Strategy set the development targets for Africa in the period 2022-2032. Dwindling growth, led to development of scenarios for African Countries to improve informed climate change issues outlined in the 2022-2032 strategy in concurrency with the short period 2022-2027. The national and regional planning institutions will play a key role in mainstreaming and integrating climate change and environment into the annual development programmes, projects, and activities. These involve mainstreaming climate change into blue economy sectors including and not limited to fisheries, water, agriculture, transport, trade, energy, rural development among others.

Mainstreamed and Africa water, linked to land and forest policies contribute to international carbon market offsets. Africa has agricultural, water, forestry, food security, drought crop perceived climate change adaptation and resiliency. Initiatives integrating programs and adopted risk management form part of blue economy development. Climate change is recognized by the national and regional institutions as one of the factors determining future water management, agricultural production, and productivity. Programmes and projects are necessary for adaptation, mitigation, and resiliency.

4.2. Progress to Mainstreaming and Integrating Climate Change into Blue Economy

Thus far, the experience of demonstrating how to mainstream and integrate climate change into blue economy, lacks adequate data to support the approach

framework proposed in **Figure 5** above. Significant progress against each of the four steps in **Figure 4**, relates to existing information and data on climate change adaptation, mitigation, and resiliency with hardly bearing on blue economy. In **Figure 4**, AU strengthened Centers of Excellence and body of regional and national level expertise around climate change, environment, fisheries, aquatic biodiversity, and blue economy are important. AU efforts in fisheries as a result, show mainstreaming and integration into blue economy. Africa has long been in the center of meetings establishing basis for approach framework to mainstream and integrate climate change into the blue economy.

In **Figure 4**, targets are key to Africa strategies, plans, guidelines and activities at national, and regional levels to raise awareness on climate change impacts and seek opportunities to mainstream and integrate the blue economy. The working 55 African Governments and Regional Economic Communities (RECs) in part of rolling out the Blue Economy Strategy, held regional and continental workshops as part of the programme for raising awareness and building and strengthening institutional capacity on blue economy. Climate resilience emerged as a significant component for capacity building and knowledge management. The AU-IBAR technical assistance with support from EU, Norway and Sweden is supporting contributing to strategic plans necessary to foster blue economy as a source of development, job creation, income generation and improving livelihoods. The AU-IBAR blue economy and RECs blue economy are critical to mainstreaming.

Thus far, blue economy for Africa is illustrated in **Figure 4**. Africa blue economy strategy process identified five key project areas for short-, medium- and long-term investment. The national and regional institutions are in the process of preparing and developing blue economy strategies anchored to the Africa Blue Economy Strategy. AU-IBAR has supported Somalia, Burkina Faso, Congo Republic, and Madagascar to develop national blue economy strategies, and regional blue economy strategies for EAC, COMESA and ECCAS. AU-IBAR is in the process of securing funding to support more African Countries and regions to develop and implement blue economy strategies. African countries have potential opportunities and the private sector to foster blue growth. Learning from these projects for informing wider scale of adaptation, mitigation and resiliency will enhance mainstreaming and integration into blue economy.

The approach framework as described in **Figure 5**, to mainstream and integrate climate change adaptation, mitigation, and resiliency gain experience from AU-IBAR work done considering adaptation, mitigation, and resiliency. Blue economy strategy and regional initiatives build on national activities. Round of supporting blue economy strategies at national and regional levels will foster economic diversity and geographical spread with the focus on “mainstreaming and integrating climate change adaptation, mitigation, and resiliency”, mainstreaming approach framework.

Approach framework on mainstreaming climate change into blue economy, is regarded as adequate and integrated framework of adaptation, mitigation, and

resiliency. Framework contextualizes blue economy and resiliency. Transformation of institutional change framework is in key five areas of AU-IBAR blue economy. Framework regionally driven and supported by the AU-IBAR blue economy funded initiative in part by development partners financial streams demonstrating the blue economy. Adaptation, mitigation and resiliency at national, and regional require investment, and financing.

4.3. Challenges and Milestones for Mainstreaming Climate Change into Blue Economy

National and regional institutions engaged in development of blue economy strategies and climate change planning in Africa show some challenges to implementing action plans. Some of the challenges include inadequate frameworks for institutional and regional organs; relevant blue economy, climate change biodiversity; weak capacity resulting from flight manpower of experts, dissemination, and information sharing. Blue economy is not systematic and emerging in piecemeal and lacks finances and investments, funds, unavailability of experts. The mainstreaming and integration of climate change into blue economy at the national and regional levels is complex. AU-IBAR effortlessly catalyzes interest of AU Member Countries through political affiliated system with frequent technical committee and high level ministerial and heads of States meetings to manifest blue economy agenda, resulting to progress in mainstreaming and integrating climate change adaptation, mitigation, and resiliency.

The steps (Figure 4) and the approach framework (Figure 5) of mainstreaming and integrating climate change into blue economy, stipulate, Figure 4 model and integrating adaptation, mitigation and resiliency do not build strengthened institutional approach framework. In Figure 5 suggested for mainstreaming as space of design is not distinctly clear.

Prerequisite, Africa blue economy strategy, blue growth, adaptation, mitigation, and resiliency take place in the phase of uncertainty. Regional and national blue economy strategies studies in Africa have shown that where evidence on blue economy is impacted by climate change, there was clear lack of data that could as originating sources. Blue economy has resiliency to inform, articulate, and formulate the policy for blue economy activities.

Africa blue economy and change continuously and strategically grounded at national and regional institutions including interventions by policymakers and development planners and cross-sectoral experts. The Africa Blue Economy Strategy is considered as work in progress and living document and will be updated regularly to accommodate institutional needs. We reflect in Figure 4 towards mainstreaming climate change adaptation, mitigation, and resiliency in blue economy. We also show complexity as highlighted in Figure 5.

5. Conclusion and Recommendation

Considering linkages in climate change adaptation, mitigation resiliency, devel-

opment, and the blue economy, it is essential to address the mainstreaming in an integrated framework. Mainstreaming has different expressions. It may apply to integrating climate change adaptation, mitigation and resiliency into development planning, or development into adaptation planning and or the blue economy. It could also relate to environmental and disaster. Several mainstreaming applied regional frameworks. Regional framework as indicated in **Figure 5** to blue economy can enhance adaptation, mitigation, and resilience arrangements.

Figure 4 presents a process of innovation in a stepwise approach. Africa, ways, abridged in conceptualizing the framework and designing projects for business financing and investments. This is because of available information and data on blue economy in some parts of Africa, and indeed other African Countries have highlighted the need for support to develop blue economy strategies to enable them to accord the role of institutions for necessary social transformation.

In this paper, we have made some effort to suggest and propose that the four-step model and approach framework for mainstreaming work is a contribution to further research on mainstreaming and target climate change and blue economy as important areas of intellectual discourse. Mainstreaming climate change adaptation, mitigation, and resiliency into blue economy are essential to planning, policy articulation and formulation. The four steps and approach framework presented and discussed in this paper provide some strategic suggestions, directions, and guidance on related aspects.

Therefore, we make the following recommendations:

Further research should be carried out and investigate the institutional arrangements and programmes, projects and activities suitable for mainstreaming climate change into sustainable development.

Further research work should investigate framework in the context of climate change and the blue economy, clearly establishing necessary linkages to the blue economy pillars.

Further research work should investigate how mainstreaming climate change into blue economy will result into providing information on how financial and technological resources would be mobilized to enhance actions necessary to mitigate effects of climate change in Africa.

Authors' Contributions

Patrick Karani, principal author, was one of the experts that developed the AU Africa Blue Economy Strategy; Blue Economy Framework for Governance and Coordination Mechanism; and Implementation Plan. He contributed to the chapter on: Coastal and maritime tourism, climate change, resilience, environment, infrastructure. He participated in the validation workshops of the COMESA regional Blue Economy Strategy; EAC regional Blue Economy Strategy; ECOWAS Blue Economy Strategy and the Madagascar National Blue Economy Strategy.

Pierre Failler, corresponding author, was the lead expert of the AU Africa Blue Economy Strategy. He contributed to the Fisheries, aquaculture, conservation

and sustainable aquaculture systems, and Policies, institutional and governance, employment, job creation and poverty eradication, innovative financing, Blue Economy Framework for Governance and Coordination Mechanism; and Implementation Plan. He also developed the Madagascar National Blue Economy Strategy.

Asmerom Mengisteab Gilau, contributed to Africa Blue Economy Strategy chapter on Sustainable energy and mineral resources and innovative industries, Blue Economy Framework for Governance and Coordination Mechanism; and Implementation Plan. He also developed the Somalia National Blue Economy Strategy.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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