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Strengthening maritime security for ocean sustainability within Namibia's green economy transition

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Abstract

This study evaluates Namibia's maritime security frameworks and their role in facilitating the country's transition to a green economy. Namibia's coastline, rich in marine resources, presents both opportunities and challenges for sustainable development. This study investigates the effectiveness of current ocean governance and conservation strategies in promoting sustainability, identifies gaps and opportunities in maritime security, and proposes policy recommendations for enhancing sustainable ocean management. Grounded in global sustainability principles, the research aligns Namibia's maritime security agenda with Sustainable Development Goals (SDGs) 14 (life below water) and 16 (peace, justice, and strong institutions). A qualitative research approach was employed, combining policy document analysis with stakeholder consultations conducted through semi-structured interviews. This methodological design enabled the collection of nuanced insights into policy frameworks, institutional capacities, and stakeholder perspectives on maritime security and sustainable ocean governance. The findings reveal the critical role of effective maritime security and governance in advancing Namibia's green economy aspirations. This study contributes to global discussions on operationalizing sustainable ocean principles by addressing socio-economic and environmental dimensions of maritime security.

Keywords: *maritime security, sustainable oceans, green economy, ocean governance, conservation strategies, Namibia*

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1. Introduction

Maritime security plays a crucial role in global efforts to ensure the safety, sustainability, and economic viability of ocean-based industries, particularly in Namibia. It encompasses measures to prevent illegal activities such as piracy, illegal fishing, marine pollution, and unregulated resource extraction [1]. Oceans cover approximately 71% of the Earth's surface and serve as critical ecosystems that support biodiversity, regulate climate, and provide economic resources essential for national development in Namibia [2]. The effective governance of these marine spaces is vital for achieving sustainable development, particularly in countries like Namibia, where the marine economy is a cornerstone of national economic growth [3].

The concept of a blue economy has emerged as a framework for fostering economic growth while ensuring environmental sustainability and social inclusion [4]. Within the context of ocean governance, transitioning to a blue economy entails promoting sustainable fisheries, marine biodiversity conservation, and climate-resilient infrastructure while ensuring maritime security [5]. The operationalization of maritime security within sustainable ocean governance is essential to achieving global sustainability targets such as the Sustainable Development Goals (SDGs), particularly SDG 14 (life below water) and SDG 16 (peace, justice, and strong institutions) [6]. While the blue economy emphasizes ocean-based sustainability, this study adopts the green economy lens to capture a more integrated, cross-sectoral approach that addresses environmental factors, social inclusion, and economic transformation across both land- and sea-based systems.

Namibia boasts an extensive coastline stretching approximately 1570 km along the South Atlantic Ocean, making the country heavily reliant on its marine economy. Namibia's exclusive economic zone is among the richest in marine biodiversity and fishery resources, contributing significantly to national gross domestic product (GDP) through industries such as fishery, marine tourism, and offshore oil and gas exploration [3]. Recognizing the importance of sustainable ocean management, Namibia has integrated green economy principles into its national development agenda through policies like the blue economy policy framework and marine spatial planning initiatives [7].

However, a significant research gap exists in understanding the effectiveness of Namibia's maritime security measures in driving sustainability outcomes, particularly ocean governance. While the country has introduced relevant policies, empirical assessments evaluating their performance and integration into green economy transition strategies remain limited. Most of the existing literature focuses on sectoral performance (e.g., fisheries, pollution control) or international compliance (e.g., UNCLOS), without critically analyzing the institutional effectiveness, i.e., existing frameworks, enforcement mechanisms, and governance coherence that underpin maritime security operations [5, 8, 9].

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As highlighted by Bueger et al. [10, 11], maritime security efforts often face fragmentation, coordination issues, and limited evaluation in small and developing coastal states. Similarly, the African Union (AU)'s 2050 Africa's Integrated Maritime Strategy acknowledges that weak inter-agency cooperation and inadequate monitoring significantly hamper national maritime governance across the continent, including Namibia [12]. Thus, the absence of integrated, evidence-based assessments of Namibia's maritime security effectiveness constitutes a research void—particularly regarding how well these efforts align with the national blue/green economy transition and their capacity to protect marine biodiversity, enhance climate resilience, and secure livelihoods.

This study is positioned to fill this gap by combining a policy evaluation approach with stakeholder insights to explore how maritime security supports sustainable ocean management within Namibia's evolving development framework.

1.1. Theoretical perspective of maritime security

Maritime security and ocean governance are increasingly recognized as critical components of sustainable development, particularly in coastal nations like Namibia. The theoretical foundation of this study draws from several interrelated frameworks that elucidate the linkages between maritime security, ocean governance, and the transition to a green economy. These perspectives provide a lens for understanding the governance mechanisms, regulatory structures, and institutional arrangements that shape Namibia's maritime security landscape and its role in fostering sustainability. The theoretical discourse is grounded in three main perspectives: the theory of ocean governance, the blue economy framework, and socio-ecological resilience theory. These theoretical constructs offer insights into how maritime security measures interact with environmental conservation efforts and sustainable economic growth while aligning with international sustainability objectives such as the United Nations' SDGs, particularly SDGs 14 and 16, respectively.

The theory of ocean governance provides a structured framework for analyzing the mechanisms through which maritime resources are managed, protected, and utilized for economic development. Ocean governance, as articulated by scholars such as Brodie Rudolph et al. [13, 14], encompasses a broad range of policies, legal frameworks, and institutional arrangements that regulate human interactions with the marine environment. This perspective is particularly relevant to Namibia, where ocean governance structures must address challenges such as illegal, unreported, and unregulated fishing, marine pollution, and habitat degradation while promoting economic activities like fishery and maritime trade [15]. Effective ocean governance is characterized by transparency, participatory decision-making, enforcement mechanisms, and adaptive management strategies, which collectively enhance the security and sustainability of marine resources [16]. In Namibia, the institutional architecture governing maritime security includes national policies such as the Marine Resources Act (2000) and international agreements such as the United Nations Convention on the Law of the Sea, which provide legal frameworks for sustainable marine resource management [17]. The theory of ocean governance emphasizes the need for a coordinated, multi-stakeholder approach to address maritime security challenges, particularly in contexts where ecological sustainability and economic viability must be balanced [18].

Closely related to ocean governance is the blue economy framework, which conceptualizes the sustainable utilization of ocean resources as a means of achieving economic growth while maintaining environmental integrity. The blue economy is rooted in sustainable development principles and integrates ecological, economic, and social dimensions to ensure long-term viability of ocean-based industries [19]. The theoretical underpinnings of the blue economy emphasize the need for innovation, ecosystem-based management, and resource efficiency in maritime activities. In Namibia, the blue economy approach is particularly relevant given the country's reliance on marine resources for economic development, including fisheries, aquaculture, maritime transport, and offshore energy exploration [14, 20, 21]. However, achieving a sustainable blue economy requires robust maritime security measures that prevent the overexploitation and degradation of marine ecosystems.

The intersection of maritime security and the blue economy highlights the importance of policy coherence, regulatory enforcement, and stakeholder collaboration in ensuring that marine-based economic activities contribute to sustainable development rather than exacerbating environmental vulnerabilities [16]. Scholars such as Basurto et al. and Okafor-Yarwood et al. [17, 21] argue that an effective blue economy strategy must integrate ecological safeguards, social inclusivity, and economic diversification to ensure long-term sustainability. Namibia's efforts to transition to a green economy necessitate a well-structured maritime security framework that aligns with blue economy principles, ensuring that ocean resources are managed in a manner that supports economic resilience while minimizing ecological harm [17, 21].

The socio-ecological resilience theory provides another critical perspective for understanding the relationship between maritime security and sustainable development. Resilience theory, as later on expanded by Sesana et al. [22], focuses on the capacity of ecological and social systems to absorb shocks, adapt to change, and maintain functional integrity in the face of disturbances. In the context of maritime security, resilience theory highlights the adaptive capacity of governance structures in responding to threats such as climate change, biodiversity loss, and illegal maritime activities. The resilience of Namibia's maritime security framework is crucial for ensuring that the country's ocean governance mechanisms can withstand environmental pressures and socio-economic fluctuations [16]. The application of resilience theory in maritime security emphasizes the need for early warning systems, adaptive management strategies, and cross-sectoral collaboration to enhance the ability of institutions to respond effectively to emerging challenges [15]. This perspective is particularly relevant given the increasing threats posed by climate change-induced ocean variability, which affects marine biodiversity, fishery stocks, and coastal communities. By incorporating resilience-based strategies, Namibia can enhance the capacity of its maritime institutions to mitigate risks, enforce regulations, and foster sustainable ocean resource management.

An integrated approach that combines ocean governance, the blue economy framework, and socio-ecological resilience theory provides a comprehensive understanding of the linkages between maritime security and sustainable development. Namibia's transition to a green economy depends on the ability of its maritime security structures to regulate and protect ocean resources while fostering sustainable economic activities. Effective ocean governance ensures that legal and institutional mechanisms are in place to regulate maritime activities, while the blue economy framework provides a roadmap for economic

diversification and environmental conservation. Simultaneously, resilience theory highlights the adaptive capacity required to address emerging threats such as climate variability, geopolitical tensions, and technological advancements in maritime security enforcement. The interplay of these theoretical perspectives underscores the need for a holistic policy approach that integrates ecological sustainability, economic growth, and governance effectiveness.

The relevance of these theories is further reinforced when considering Namibia's obligations under international sustainability frameworks such as the SDGs. SDG 14, which focuses on life below water, emphasizes the importance of conserving and sustainably using ocean resources, aligning directly with maritime security efforts to combat IUU fishing, marine pollution, and habitat destruction [15]. Namibia's adherence to SDG 14 necessitates strong maritime law enforcement, ecosystem conservation programs, and regional cooperation in ocean governance. Similarly, SDG 16, which promotes peace, justice, and strong institutions, is highly relevant in the context of maritime security. A well-functioning maritime security framework enhances institutional capacity to enforce laws, combat transnational maritime crimes, and promote fair resource distribution, thereby fostering governance stability and economic resilience [22]. The intersection between maritime security and these SDGs reinforces the need for integrated policy approaches that balance environmental conservation with economic imperatives.

The theoretical perspectives discussed in this study emphasize the complex interdependencies between security, governance, and sustainability in maritime spaces. The ocean governance framework highlights the institutional arrangements required to regulate maritime activities, the blue economy theory provides a pathway for achieving sustainable economic growth through marine resource management, and socio-ecological resilience theory underscores the importance of adaptive capacity in responding to environmental and socio-political threats. Collectively, these perspectives provide a robust theoretical foundation for analyzing the effectiveness of Namibia's maritime security framework in facilitating a transition to a green economy.

Figure 1 depicts the nexus and implications for leveraging the three concepts. The model is built on a conceptual synthesis of the literature and policy frameworks in which maritime security, ocean governance, and the blue economy intersect, as key pillars for achieving sustainable ocean development. It draws from global and regional strategies emphasizing environmental, social, and economic sustainability, integrating principles from the blue economy concept advanced by Alliance of Small Island States (AOSIS, 2012) and works such as Silver et al. [23], which advocate for cohesive and restorative ocean governance aligned with security and sustainability goals. The intersection of maritime security, ocean governance, and sustainable economic transition requires an interdisciplinary approach that integrates regulatory, ecological, and economic considerations.

Namibia's efforts to operationalize maritime security within the broader framework of sustainable ocean governance must leverage the theoretical insights provided by ocean governance theory, the blue economy framework, and socio-ecological resilience theory. These perspectives offer a structured pathway for enhancing institutional effectiveness, fostering economic sustainability, and ensuring ecological integrity, all of which are critical for the successful realization of Namibia's green economy ambitions. Through policy coherence, institutional coordination, and stakeholder engagement, maritime security can serve as a cornerstone for achieving long-term sustainability, reinforcing Namibia's commitment to both national development goals and global sustainability frameworks.

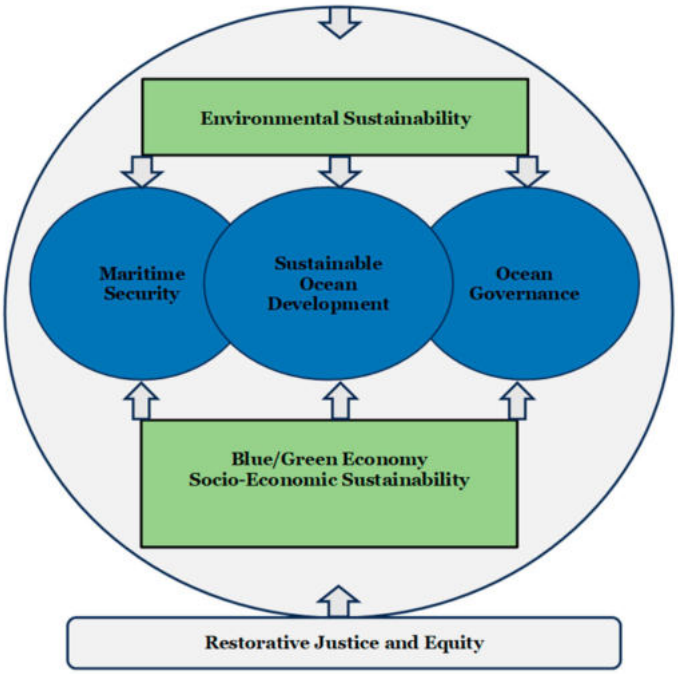

Figure 1 • The nexus between ocean sustainability, technology, and policy.

2. Materials and methods

Namibia, located in southwestern Africa, has a 1572 km coastline along the Atlantic Ocean, making maritime security and ocean governance crucial for its economic and environmental sustainability. The country's exclusive economic zone (EEZ) extends 200 nautical miles offshore, covering an area of approximately 580,000 km^2, rich in marine biodiversity and critical resources such as fisheries, oil, and gas [20]. Given its vast oceanic resources, Namibia has been at the forefront of promoting the blue economy, integrating maritime security into its sustainable development framework. This study focuses on three key coastal areas that are central to Namibia's maritime security and blue economy transition:

1. Walvis Bay—Namibia's primary deepwater port and an economic hub with significant maritime security challenges related to illegal fishing, smuggling, and conservation concerns.
2. Lüderitz—A key fishing and aquaculture zone, facing environmental sustainability issues due to industrial expansion and climate change impacts.
3. Skeleton Coast—A protected area with a high concentration of marine protected areas (MPAs) critical for biodiversity conservation but also vulnerable to illegal marine activities.

These locations were selected because they represent diverse maritime security and governance challenges, providing a holistic understanding of how Namibia's ocean governance structures are operationalized. **Figure 2** illustrates the study focus on Namibia's three key coastal regions—Walvis Bay, Lüderitz, and the Skeleton Coast—which represent distinct maritime security and conservation dynamics.

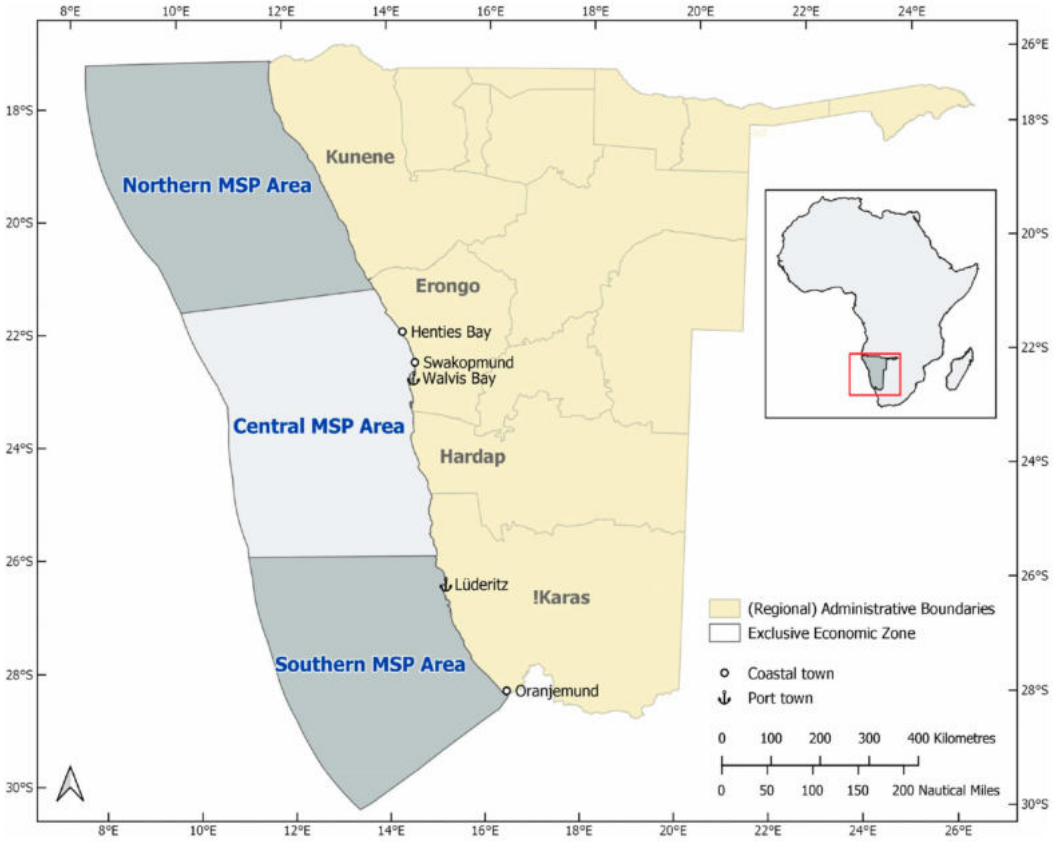

Figure 2 • Administrative boundaries of the study areas and characteristics.

This study adopts a qualitative research approach, emphasizing document analysis, key informant interviews (KIIs), and thematic content analysis. In other words, the approach aligns with a systematic qualitative methodology using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). By relying on non-numerical data, this research explores the depth and complexity of maritime security frameworks and their role in Namibia's green economy transition. The study is grounded in a constructivist paradigm, which prioritizes subjective interpretations and multiple perspectives from key stakeholders involved in Namibia's maritime governance.

Data collection involved two primary sources: (1) document analysis and (2) interviews. The document analysis focused on reviewing maritime security policies, strategic plans, legal frameworks, and international agreements to assess Namibia's compliance with global best practices in ocean governance. Key documents include the Namibia national maritime strategy, the Marine Resources Act (2000), the Environmental Management Act (2007), and international agreements such as the United Nations Convention on the Law of the Sea (UNCLOS) and the FAO Port State Measures Agreement (PSMA). These documents provide insights into the existing governance mechanisms and enforcement challenges and their alignment with sustainability principles.

In addition to document analysis, semi-structured interviews were conducted with two government officials, three maritime security experts, two conservation organizations, three port authorities, and five local fisherfolk. These interviews explored stakeholders' perceptions of Namibia's maritime security effectiveness, governance gaps, and opportunities for strengthening sustainable ocean management. A total of 15 participants were selected through purposive sampling, ensuring that only individuals with direct involvement in maritime security and conservation contributed to this study. The interviews were recorded, transcribed, and coded using thematic content analysis (TCA) to identify emerging patterns and key themes. The review followed the PRISMA flow: identification, screening, eligibility, and inclusion.

To analyze the qualitative data, this study employed an inductive thematic content analysis approach. The aim was to allow patterns and themes to emerge organically from the data without imposing pre-existing categories or theoretical constructs. The process was iterative and grounded in Braun and Clarke's [24] six-phase framework for thematic analysis, ensuring methodological rigor and transparency.

Step 1: Data familiarization—Following data collection, all interview transcripts and policy documents were read multiple times to gain an in-depth understanding of the content. This familiarization phase allowed the researcher to be immersed in the data, taking preliminary notes on recurrent ideas and potential areas of focus.

Step 2: Initial coding—Transcripts and documents were imported into qualitative analysis software (e.g., NVivo), and open coding was conducted manually. Short, descriptive codes were generated to capture significant statements and recurring patterns across the dataset. These codes included terms such as "weak law enforcement", "capacity building gaps", "policy overlap", "marine protection zones", and "stakeholder participation".

Step 3: Collating codes into potential themes—Next, codes were grouped based on conceptual similarity and relational patterns. This step involved comparing coded segments across different interviews and documents to identify broader categories. Codes were clustered under candidate themes that captured the underlying narrative or challenge represented. In this stage, four core themes

were developed: "policy effectiveness", "enforcement challenges", "governance gaps", and "sustainability opportunities".

Step 4: Reviewing and refining themes—The identified themes were then reviewed against the entire dataset to ensure internal coherence and distinction between themes. Some overlapping or ambiguous codes were re-assigned, and sub-themes were identified where necessary. For example, under "governance gaps", sub-themes included "fragmented mandates" and "lack of regional coordination".

Step 5: Interpretation and synthesis of findings—After themes were finalized, a deeper level of interpretation was applied to understand the interrelations between the themes and their implications for Namibia's maritime security governance. Unlike the earlier phases where interpretation was used to generate meaning within each theme, this phase aimed to synthesize insights across themes and relate them back to the broader research questions and conceptual framework. For instance, the interaction between "enforcement challenges" and "policy effectiveness" highlighted systemic barriers in operationalizing strategic frameworks.

Step 6: Triangulation and validation—To enhance the credibility of findings, triangulation was employed by comparing insights across three data sources: policy documents, expert interviews, and community-level stakeholder inputs. This cross-validation strategy reduced bias and helped confirm that the emerging themes were not isolated to a single respondent group or document type.

The entire thematic analysis was conducted inductively, meaning that codes and themes were not predetermined but instead emerged from the data itself. This was crucial for capturing nuanced, context-specific insights related to Namibia's maritime governance, rather than forcing alignment with externally derived categories. This inductive process also aligned with the constructivist paradigm guiding this research, which emphasizes subjective meanings and the co-construction of knowledge through dialog and reflection.

To ensure research credibility and validity, triangulation was also used by comparing insights from policy documents, expert interviews, and stakeholder narratives. This helped mitigate biases and strengthen the reliability of findings. Additionally, ethical considerations were observed throughout the research process. Informed consent was obtained from all interview participants, and confidentiality was maintained to protect sensitive security-related information.

Despite its robust qualitative design, this study faced certain limitations. One major challenge was restricted access to classified maritime security reports, limiting the depth of the analysis on enforcement effectiveness. Additionally, stakeholder perspectives varied significantly, with some respondents framing their responses based on institutional interests rather than objective realities. To address these limitations, multiple sources of data were used to cross-validate findings and ensure a balanced interpretation of Namibia's maritime security governance (**Table 1**).

By utilizing a qualitative methodology, this study provides a rich, in-depth analysis of Namibia's maritime security landscape and its role in facilitating the country's transition to a sustainable blue economy. The findings contribute valuable insights for policymakers, conservationists, and maritime authorities seeking to enhance ocean governance and promote sustainable development in Namibia. A summary table of the multiple data sources used in this study is provided below to enhance transparency and credibility.

3. Results and discussion

An agenda for sustainable oceans

Having discussed the methodology and theoretical perspectives, this section presents the empirical findings generated through thematic content analysis, which was applied consistently across both key informant interviews and policy documents. The findings are structured around key themes that align with the research objectives introduced in Section 1, namely the following: (1) evaluating the effectiveness of Namibia's maritime security frameworks in promoting a transition to a green economy, (2) identifying existing challenges and opportunities within Namibia's maritime governance structures, and (3) proposing policy recommendations to strengthen maritime security for sustainable ocean management.

The themes presented—such as *maritime security measures*, *governance challenges*, and *resilience-building opportunities*—were inductively derived from the coded data and validated against the literature and policy frameworks. Each theme is supported by evidence from both documentary sources and interview quotes and further synthesized in tables highlighting key insights. The findings are discussed in relation to international best practices, national policy goals, and the broader discourse on sustainable ocean governance.

3.1. Maritime security measures

Firstly, it is common knowledge that ocean governance and green economy are positively correlated to the nexus and implications for achieving Namibia's sustainable development agenda. For instance, according to the 2024 United Nations' Sustainable Development Goals (UN-SDGs) report, Namibia's SDG 14 is increasing at less than 50% of the required rate [25]. Thus, to assess the effectiveness of maritime security measures in Namibia, this study examined existing policies, their implementation mechanisms, and their alignment with green economy objectives. Therefore, the evaluation criteria included regulatory enforcement, institutional coordination, resource allocation, technological capacity, and stakeholder engagement. The criteria used to assess maritime security effectiveness (**Figure 3**) were drawn from both international best practices (e.g., UNCLOS) and Namibia's blue economy policy. These criteria informed the coding framework and guided the categorization of data during the analysis stage.

The findings revealed in **Figure 3** illustrate that Namibia's maritime security measures align with and contribute to supporting the transition to a green economy. These measures align with key green economy goals such as clean energy, transport, eco-tourism, waste management, biodiversity conservation, social inclusion, and green infrastructure, thereby enhancing sustainable ocean governance, i.e., the blue/green economy transition. For instance, the blue economy policy (2022) and marine spatial planning (MSP) provide a foundation for renewable energy development and coastal ecosystem protection, while the marine pollution contingency plan ensures effective waste management and supports eco-tourism. Coastal management and the national constitution foster sustainable transport and equitable opportunities for coastal communities, although more integration between maritime and land-based policies is needed for sectors like green agriculture (aquaculture).

Table 1 • Summary of multiple data sources used for triangulation.

Data source type	Specific source or stakeholder group	Purpose or insight provided
Policy documents	Namibia Blue Economy Policy (2022–2031); National Marine Pollution Contingency Plan; National Policy on Coastal Management for Namibia; and Namibia's 5th National Development Plan (NDP 5)	Governance framework and national priorities
	Marine Resources Act (2000); Environmental Management Act, (2007); Water Resources Management Act, (2013); National Heritage Act, (2004); and Namibian Ports Authority Act (1994)	Legal foundation for marine resource management, environmental protection mandates, life below water and port management
	United Nations Convention on the Law of the Sea (UNCLOS) and FAO Port State Measures Agreement (PSMA)	International maritime law compliance, enforcement, and sustainability practices
Government officials	Ministry of Fisheries and Marine Resources (MFMR) and Port and Administrative Management Officials	National policy implementation and enforcement insights
Maritime security experts	University researchers and consultants	Analysis of enforcement mechanisms and technical constraints
Conservation organizations	National NGOs focused on marine protection	Insights on environmental sustainability and stakeholder engagement
Port authorities	Managers from Walvis Bay and Lüderitz Ports	Port security, operational challenges, and enforcement infrastructure
Local fisherfolk	Artisanal fishers from coastal communities	Ground-level experiences, community challenges, and governance feedback

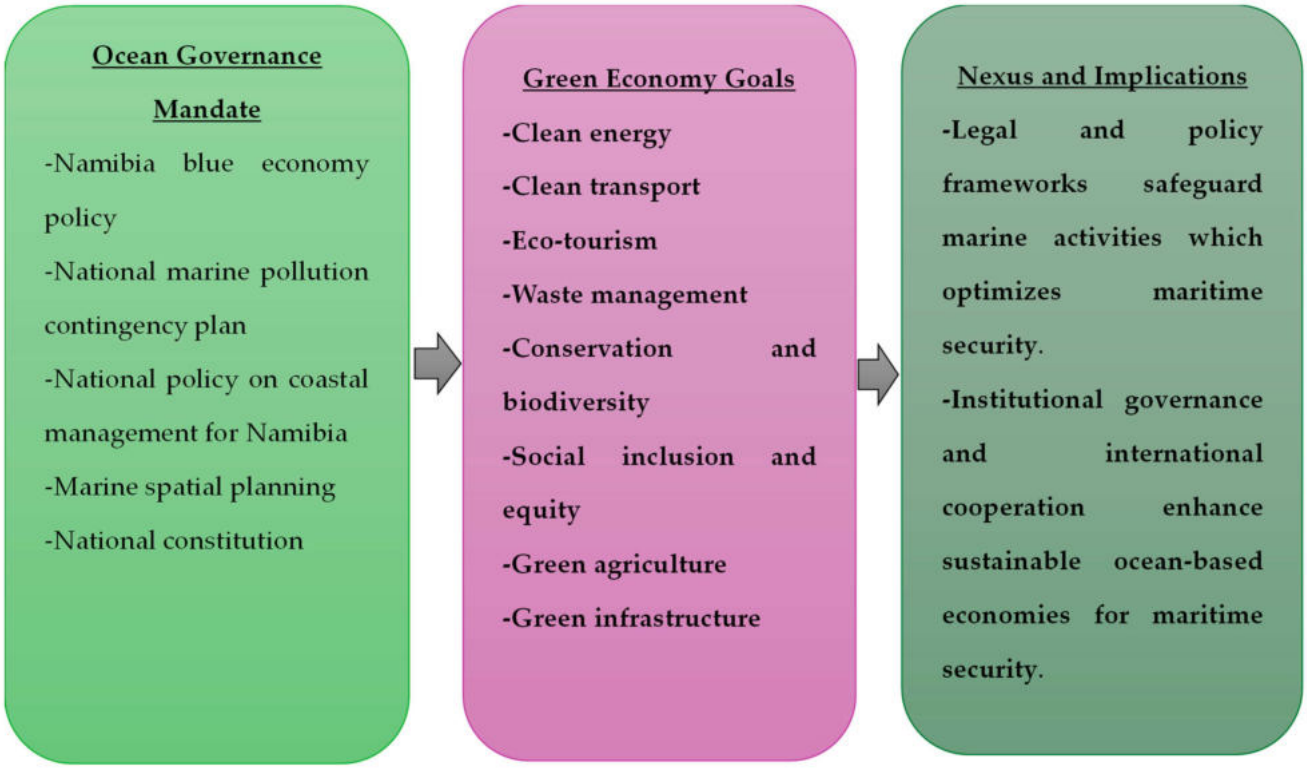

Figure 3 • Maritime security measures and green economy linkages.

These level of commitment to achieving sustainable ocean governance shows that Namibia's maritime security measures have a moderate to high impact in promoting blue/green economy goals [26], but further efforts are required to strengthen connections, especially in clean energy and green agriculture goals. These involve aligning policies and plans with international best practices such as UNCLOS, the FAO Port State Measures Agreement framework, or other standards. These themes (**Table 2**) were formed from coded segments in interviews and cross-referenced with content in documents such as the National Development Plan 5 (NDP 5), the National Coastal Policy, and the Marine Resources Act. **Table 2** further provides a synthesis of these findings using variables or themes that emerged during thematic analysis, including the green economy objective, associated maritime policy measures, perceived effectiveness (as judged by informants and policy benchmarks), and a brief interpretation.

Further insights suggest that maritime security frameworks have been partially successful, with notable progress in enforcement mechanisms but persistent gaps in surveillance, inter-agency coordination, and IUU fishing control [26]. These findings are supported by interview responses and document references. Policies such as the Marine Resources Act (2000) and the national maritime strategy, i.e., Namibia's national Blue Economy Policy (2021), provide a legal foundation for ocean governance [27]. However, enforcement limitations are consistently flagged. A senior official from the Ministry of Fisheries and Marine Resources (MFMR) highlighted the following: *"Namibia has some of the most advanced fishery's laws in Africa, but our biggest problem is enforcement at sea. We lack sufficient patrol vessels and personnel to cover the entire EEZ."* This quote illustrates how thematic codes like "resource limitations" and "policy–practice gaps" were developed and reinforced through multiple interviews.

Similarly, insights from Namibia's port authorities reveal improvements in technological surveillance using satellite monitoring and vessel tracking systems (VTSs), yet limitations remain. A maritime security expert noted, *"while we can track larger vessels, artisanal fishers and illegal trawlers often evade detection due to outdated monitoring equipment."* These accounts are triangulated with policy content indicating gaps in surveillance investment and are thus categorized under "technological capacity constraints". Despite these challenges, success stories emerge from regional initiatives such as the SADC (Southern African Development Community) regarding maritime cooperation. These collaborations have enhanced intelligence-sharing and response coordination. According to a security analyst, *"regional cooperation has made it easier to combat maritime crimes, but we still struggle with bureaucratic delays in information exchange"*. The effectiveness of Namibia's maritime security is thus a work in progress, requiring sustained investments, policy harmonization, and regional data-sharing reforms.

Table 2 • Effectiveness of maritime security frameworks.

Variables: (1) green economy goals, (2) maritime security measures, (3) effectiveness, and (4) discussion
1–Clean energy. 2–Namibia's blue economy policy and marine spatial planning. 3–Moderate. 4–MSP facilitates the identification of sites for offshore renewable energy. However, integration with clean energy development is still evolving.
1–Transport. 2–The national policy on coastal management and national constitution *. 3–High. 4–Secure and sustainable shipping routes are essential for eco-friendly transport. These policies help develop responsible coastal infrastructure.
1–Eco-tourism. 2–The national marine pollution contingency plan and national coastal management policy. 3–High. 4–Pollution control enhances Namibia's appeal for eco-tourism by protecting marine biodiversity and coastal areas.
1–Waste management. 2–The national marine pollution contingency plan. 3–High. 4–Effective waste management supports cleaner oceans, aiding in reducing pollution and promoting sustainable tourism.
1–Conservation and biodiversity. 2–Namibia's blue economy policy, national coastal management policy, and MSP. 3–High. 4–These policies protect marine ecosystems, prevent overfishing, and maintain biodiversity, directly supporting conservation efforts.
1–Social inclusion and equity. 2–The national constitution and national coastal management policy. 3–Moderate. 4–These policies ensure equitable participation of coastal communities in maritime sectors
but need further action for broader inclusion.
1–Green agriculture and infrastructure. 2–Marine spatial planning. 3–Low. 4–The link between MSP and green agriculture is still underdeveloped, limiting integration between marine resources and sustainable land use.

* The national laws used in the analysis include the Marine Resource Act (2000), Environmental Management Act (2007), Water Resources Management Act (2013), National Heritage Act (2004), and Namibian Ports Authority Act (1994), alongside the constitution of the Republic of Namibia (1990, with amendments through to 2010), particularly its provisions related to natural resources, marine biodiversity, the state's obligations, and the role of the Ombudsman in addressing environmental concerns.

In order to strengthen the effectiveness of maritime security measures in promoting a green economy (GE) transition, this study presents an analysis of the 2024 UN-SDGs report and indicators for measuring SDG 14 (life below water) performance or achievement in Namibia. Interpretation from **Table 3** indicates that the overall progress in SDG 14 is less than 50% of the required rate, i.e., progress is lacking where significant challenges remain, as proposed by Sachs et al. [25]. These findings underscore the previous affirmation that maritime security frameworks, i.e., ocean governance in Namibia, have been partially successful, with notable progress but persistent challenges in achieving a green economy. This implies that its effectiveness can be assessed based on key sustainability indicators linked to SDG progress, particularly in marine biodiversity protection, ocean health, and responsible fisheries.

Linking the effectiveness of maritime security to SDG 14 indicators, **Table 3**, which synthesizes findings from the Namibia ocean governance report (2022), FAO Fisheries and Aquaculture Country Profile—Namibia (2021), and key informant interviews, reveals that the mean area protected in marine sites important to biodiversity is rated moderate. This suggests that while marine conservation initiatives are underway, including the declaration of marine protected areas (MPAs), challenges persist in expanding coverage and enforcing regulation [27]. In terms of ocean health, particularly clean water, indicators score high, supported by Namibia's national marine pollution control policy (2017) and its implementation of the London protocol on marine dumping. Interviews with officials from the MFMR confirmed that regular monitoring and enforcement efforts have helped maintain favorable marine conditions.

Similarly, data from the FAO (2021) and the Benguela Current Convention State of the Marine Environment Report (2020) show that the percentage of fish caught from overexploited stocks remains low, highlighting Namibia's robust quota system and effective enforcement under its maritime surveillance and control program. These findings were echoed by a fishery compliance officer, who noted the following: "*our patrols and quota monitoring have significantly reduced illegal, unreported, and unregulated fishing activities in the EEZ.*" However, challenges persist with unsustainable fishing practices. The rate of fish caught through trawling or dredging is rated as fair, derived from data in the Namibia Fisheries Management Plan (2020–2025) and stakeholder feedback (participant 3), indicating that bottom-trawling methods are still prevalent, despite efforts to transition toward ecosystem-based practices.

Additionally, the high rate of fish caught and then discarded—particularly small pelagic species—was flagged in both the Namibia Bycatch Report (2021) and interviews with local fish processors, reflecting value chain inefficiencies and the limited utilization of bycatch. Marine biodiversity threats from imports, such as ballast water discharge and marine invasive species, are moderately assessed in **Table 3**. This assessment draws on challenges highlighted in the Namibia National Biodiversity Strategy and Action Plan (NBSAP, 2014–2022) and is corroborated by policymakers, who noted the following: "*we lack a national registry and consistent tracking system to monitor threats from marine imports, making risk mitigation difficult*." The findings indicate that while Namibia has made notable progress in marine conservation and sustainable fishery management, there are critical areas requiring further policy intervention.

Strengthening marine protected areas and enforcing conservation regulations more effectively can enhance biodiversity protection and directly contribute to SDG 14.5. This recommendation aligns with the UNEP Marine Spatial Planning Guidelines (2018), which advocate for integrative planning across all marine sectors. The fishery sector, despite its achievements, still faces sustainability challenges. Reducing trawling and bycatch requires the adoption of selective gear technologies, as promoted in the FAO Code of Conduct for Responsible Fisheries (2016), and a shift toward community-based fishery management models piloted in Walvis Bay and Lüderitz. An interviewee stressed the following: "*if we empower local fishers and incentivize low-impact fishing methods, we can address bycatch while improving livelihoods*".

Furthermore, the lack of comprehensive data on marine biodiversity threats from imports underscores the need for a centralized marine monitoring and data-sharing platform, as recommended in the African Union Blue Economy Strategy (2019). Strengthening trade-related environmental controls and increasing transparency through digital import monitoring systems would help reinforce Namibia's sustainable trade position. Waste management remains a critical area for intervention. Findings from the National Coastal Waste Audit (2020) show that plastic debris from fisheries and port activities contributes significantly to marine pollution. Enhanced pollution control measures, including stricter enforcement of port waste management protocols and industry-wide zero-discharge policies, are essential. These measures also align with Namibia's transition objectives under the green economy transition strategy (2021–2030).

Table 3 • The 2024 UN SDG 14 index indicators and levels of achievement.

Indicators	Score
Mean area that is protected in marine sites important to biodiversity	Moderate—lack of progress in SDG where significant challenges remain
Ocean health index; clean water score	High—SDG achieved, i.e., on track to maintaining SDG achievement
Fish caught from overexploited or collapsed stocks	High—SDG achieved, i.e., on track to maintaining SDG achievement
Fish caught by trawling or dredging	Fair—decline in progress in SDG and major challenges persist
Caught fish that are then discarded	High—on track to achieve SDG but lack of progress where significant challenges remain
Marine biodiversity threats embodied in imports	Moderate—SDG information unavailable

Source: Modified from Sach et al. [25].

In summary, while Namibia's maritime security framework demonstrates moderate to high effectiveness in achieving sustainability goals, evidence from national policy documents, international reports, and stakeholder interviews confirms the need for targeted improvements in marine conservation, fishery regulation, data transparency, and waste management to fully support a resilient and inclusive green economy.

3.2. Ocean governance challenges

Having analyzed the role of maritime security in achieving sustainability, this research now proceeds to address the following question: what challenges and opportunities exist within Namibia's maritime security framework for improving the sustainable management of marine resources? The findings reveal that Namibia's maritime security policy lacks a comprehensive ecosystem-based approach that integrates climate change resilience into marine spatial planning. This was identified through an analysis of national policy documents such as the National Policy on Coastal Management and the marine spatial planning framework, which make limited reference to ecosystem-based or climate-resilient planning principles [28]. In addition, stakeholder interviews with conservation agencies reinforced this challenge. For instance, one representative from a coastal conservation NGO emphasized the following: "*without fully protected areas, marine ecosystems struggle to recover from overexploitation*". This reflects a shared concern among environmental stakeholders about the absence of fully protected marine reserves, which undermines long-term sustainability.

Furthermore, opportunities to strengthen public–private partnerships (PPPs) for enhancing maritime security infrastructure were highlighted in both the review of Namibia's Blue Economy Policy framework (2021) and interviews conducted with representatives from the MFMR and private-sector actors in the fishery and shipping industries. A participant from the fishery sector noted the following: "*effective collaboration with the private sector can help improve monitoring and surveillance, especially in remote zones where government capacity is limited*". This study, therefore, identified that greater collaboration between government agencies and private-sector stakeholders in fishery and other blue economy sectors—such as marine tourism, aquaculture, maritime transport, and offshore energy—could lead to improved resource management, monitoring, control, and surveillance (MCS).

Cross-sector coordination, as observed through both document analysis and field interviews, emerged as a recurring theme. For instance, the draft Marine Spatial Planning Bill (2023) outlines sectoral activities but lacks provisions for coordination mechanisms among fisheries, aquaculture, tourism and shipping. Interview data from a marine planner suggested the following: "*we are still working in silos; a cross-sectoral platform could enhance both resilience and governance*". This suggests that coordinated governance across blue economy sectors—fishery, aquaculture, marine mining, coastal real estate, and shipping—has the potential to enhance MCS and support sustainable ocean governance.

In strengthening the discussion, although Namibia's maritime security frameworks, such as the integrated coastal zone management plan, contribute significantly to the country's green economy transition, challenges still limit their full effectiveness. One identified challenge is the limited integration of clean energy initiatives into maritime policy frameworks. While MSP offers a platform for offshore renewable energy planning, policy analysis shows that there is no clear roadmap or strategy document dedicated to implementation. Stakeholder interviews confirmed this, with one energy sector representative stating the following: "*there is interest in offshore wind, but policy-wise, it is still just a conversation*".

Another identified challenge is the weak linkage between green agriculture/infrastructure and maritime security measures. This was evident from a cross-review of the Green Plan (2022) and the Namibia maritime strategy, which treat land-based development and marine protection in isolation. Opportunities for integrating marine resources into sustainable land-based planning remain underexplored. Moreover, a thematic analysis of interview transcripts and the coastal management white paper highlighted the lack of community-driven inclusion policies. While the national constitution and policy frameworks recognize social equity, there is little emphasis on participatory governance. A local fisher from Walvis Bay stated the following: "*we are rarely consulted on decisions that directly affect our livelihoods*". This finding illustrates a gap in stakeholder engagement mechanisms.

Additionally, while the national marine pollution contingency plan addresses waste management broadly, data from the Namibia environmental outlook report and interviews with marine pollution officers indicate that marine plastic pollution and industrial waste disposal require stronger enforcement. This study also identified the absence of a robust monitoring and evaluation (M&E) system within maritime security policies, limiting the country's capacity to assess long-term outcomes. A port authority staff member noted the following: "*we do not really have indicators or benchmarks for what success in maritime security looks like*". This also creates a gap in assessing their long-term impact.

Addressing these challenges presents actionable opportunities—such as developing a dedicated clean energy policy for offshore renewables (wind, tidal), expanding MSP to integrate coastal agriculture, and introducing formal stakeholder participation mechanisms. Enhancing real-time data collection, surveillance systems, and enforcement procedures—via partnerships with research institutions and tech firms—would further improve Namibia's ability to manage marine pollution, enforce conservation policies, and evaluate progress. **Table 4** summarizes the challenges and opportunities in Namibia's maritime security frameworks. The information in this table is based on triangulated findings from document review (e.g., national strategies, policy reports), stakeholder interviews (n = 15), and field observations conducted during the study period (2024/2025). Each challenge was validated through at least two sources—either a document and a participant quote or multiple stakeholders citing the same issue independently.

Adapting the 2024 UN-SDGs report proposed by Sachs et al. [25] as the benchmark, this study conducted a thematic content analysis of Namibia's national blue economy policies, marine spatial planning documents, and stakeholder interviews, to identify challenges associated with maritime security frameworks in the country's transition to a green economy. The results reveal that despite notable progress in achieving SDG 14, there are persistent challenges that hinder the full operationalization of sustainable oceans and optimal resource use.

Table 4 • Restorative maritime security frameworks.

Identified challenges	Opportunities for enhancement
Limited integration of clean energy policies	Develop a clear roadmap for offshore renewable energy projects
Weak connection between maritime policies and green aquaculture/infrastructure	Expand marine spatial planning to support coastal farming/aquaculture and sustainable infrastructure
Lack of community-driven policies for social inclusion	Strengthen local participation in decision-making and resource management
Inadequate enforcement of marine plastic and industrial waste regulations	Improve monitoring, enforcement, and waste management strategies to maintain a track record for the SDG 14 index
Absence of comprehensive monitoring and evaluation reports for maritime policies	Implement real-time data collection and strategic impact assessment (SIA) mechanisms

One major challenge, identified through both policy review (Namibia's National Policy on Coastal Management, 2020) and stakeholder interviews (MFMR), is the limited expansion and enforcement of marine protected areas, which hampers biodiversity conservation efforts. A participant stated the following: "*the enforcement mechanisms are weak—many protected areas are only on paper with no boots on the ground*". Strengthening MPA networks and improving enforcement therefore presents an opportunity to enhance ecosystem resilience and support sustainable blue economy.

Although Namibia's ocean health index for clean waters is relatively high [25], marine biodiversity threats from imported goods remain poorly monitored. This was evident in trade data challenges highlighted in the Namibia Maritime Profile Report (2023) and reinforced by stakeholder feedback. One fishery officer noted the following: "*we do not have the capacity to track the biodiversity risk associated with imports*". Thus, enhancing transparency in marine trade policies and investing in real-time data systems could significantly reduce these risks. Unsustainable fishing practices, particularly bottom trawling and high discard rates, were flagged in both the 2023 FAO Country Fisheries Report and interviews with community fishers. For example, a local fisher remarked the following: "*trawlers throw away too much bycatch—it is wasteful and harmful*". The adoption of selective fishing gear and bycatch mitigation strategies are commonly recommended.

In terms of maritime security integration, this study found limited alignment between Namibia's security policies and green economy strategies. This was evident in the lack of cross-sectoral references in Namibia's NDP 5 and supported by interview responses. For instance, an energy expert commented the following: "*we talk about clean energy but rarely link it to the maritime space—it is a missed opportunity*". Investments in offshore renewable energy—such as wind and solar-powered ports—are identified as viable interventions. Waste management remains a key concern, with insufficient marine debris strategies, as shown in Namibia's 2022 ocean waste audit and confirmed by respondents. One official stated the following: "*our pollution control strategy is outdated—especially when it comes to plastic waste at sea*".

Finally, challenges around social equity and inclusion in coastal communities emerged from both policy gaps and lived experiences. Interviewees from Lüderitz and Walvis Bay highlighted the lack of representation of local voices in policy forums. A community leader noted the following: "*fisherfolk and women in coastal towns are hardly consulted*". Thus, empowering these groups through inclusive policymaking and skills development is widely supported. As summarized in **Table 5**, these findings draw directly from triangulated data sources—policy documents, stakeholder interviews, and SDG benchmark reports—and underscore the need for targeted policy interventions, sustainable technology investments, and grassroots engagement. The blue economy sectors—fishery, aquaculture, marine tourism, mining, renewable energy, transportation, and coastal real estate—are all interlinked and face multidimensional impacts across social, economic, and environmental domains.

3.3. Resilience-building opportunities

To operationalize the principles of sustainability—namely in maritime security, ocean governance, and green economy transition—across the blue economy sectors, this section addresses the following research question: what policy recommendations can be developed to better align maritime security and ocean governance practices with Namibia's green economy goals across the blue economy sectors? The findings are drawn from a thematic analysis of key stakeholder interviews and a review of national policy documents including the National Blue Economy Policy draft, integrated coastal zone management plan, and Namibia's Fifth National Development Plan.

Results reveal that the operationalizing principles must be adopted across various blue economy sectors. For example, the recommendation to prioritize marine conservation and expand marine protected areas was supported by interviews with environmental experts and marine biologists. One marine ecologist explained the following: "*there is urgent need to designate more protected zones to buffer marine ecosystems from pressure, particularly around high biodiversity areas*". This view aligns with national biodiversity targets outlined in NDP 5 and the National Biodiversity Strategy and Action Plan (NBSAP). The importance of ecosystem-based marine spatial planning emerged from both document analysis and expert opinions. Policy documents recommend balancing conservation and economic activities through zoning and risk-based MSP. In line with this, a planning officer noted the following: "*we lack a spatial tool that integrates both ecological sensitivity and economic interests*".

Further, the need for improved monitoring and data collection on marine biodiversity threats, especially from imports, was derived from stakeholder concerns. A marine biodiversity specialist stated the following: "*illegal fish imports and inadequate customs checks pose a silent threat to local species*". On sustainable fishery management, the recommendation of curb trawling and bycatch waste was identified through analysis of fishery reports and interviews with fishery officers. A fishery official shared the following: "*we continue to struggle with bycatch waste due to outdated trawling practices*". This is echoed in the Fisheries Management Plan 2021-2025, which calls for stricter regulations and gear modifications.

Table 5 • Restorative justice for oceans in SDG 14.

Key areas	Identified challenges	Opportunities for improvement
Marine biodiversity conservation	Limited expansion and enforcement of marine protected areas	Strengthening marine protected area networks and improving enforcement mechanisms
Monitoring and data transparency	Lack of comprehensive data on marine biodiversity threats from imports	Enhancing data collection, transparency, and marine trade policies
Sustainable blue economy sectors (e.g., fishery, etc.)	High levels of fish discards and over-reliance on trawling	Promoting sustainable fishing technologies and bycatch reduction strategies
Integration with green economy	Weak alignment between maritime security measures and clean energy policies	Investing in renewable energy for maritime activities
Waste management and pollution control	Inadequate pollution control and marine debris reduction strategies	Expanding the marine pollution contingency plan with stricter regulations
Social inclusion and economic equity	Limited participation of coastal communities in maritime activities	Empowering local stakeholders through capacity-building programs

The recommendation to transition to clean energy in maritime sectors is supported by both government climate commitments and expert advocacy. As one maritime policy expert explained, "*Namibia must establish a national offshore renewable energy policy to attract investments in wind and tidal power, reducing reliance on fossil fuels*". This aligns with renewable targets in Namibia's updated nationally determined contributions (2021). Similarly, promoting green port infrastructure and low-carbon maritime transport was advocated by infrastructure experts. A key quote includes "*developing green ports and low-carbon transport systems will not only cut emissions but also enhance economic efficiency*", highlighting alignment between environmental and economic goals.

Improved waste management was a strong theme across interviews and policy documents. An environmental sustainability specialist stated the following: "*we need to enforce stricter waste disposal regulations and promote circular economy practices to ensure healthier marine ecosystems*". This is reinforced by the Coastal Pollution Control Strategy 2020. Participants also stressed the importance of social inclusion, especially empowering small-scale fishers and women. A community advocate emphasized the following: "*empowering local communities, small-scale fishers, and women through training and funding initiatives is crucial for creating sustainable livelihoods*". Gender equity is underscored in the National Gender Policy 2019–2029.

On governance, a common recommendation was to establish a multi-sectoral blue economy coordination council. As a senior official explained, "*this council will foster better integration of maritime security with environmental policies and ensure alignment with global best practices for sustainable development*". **Figure 4** visually represents the proposed integrated blue economy governance (IBEG) framework that emerges from this recommendation. The adoption of the IBEG framework is crucial for strengthening maritime security and promoting ocean sustainability within Namibia's green economy transition. This framework provides a holistic, cross-sectoral approach that aligns maritime policies with Sustainable Development Goals by addressing overlapping challenges across governance, conservation, economic growth, and community resilience.

Figure 4 • Integrated blue economy governance (IBEG) framework wheel.

Specifically, the IBEG framework enhances coordinated policy action by integrating stakeholders from the government, private sector, civil society, and local communities, ensuring that maritime security measures are not siloed but linked to broader blue economy objectives. It improves monitoring, control, and surveillance by incorporating technological innovations and real-time data, essential for addressing illegal activities and managing resources sustainably. The framework also promotes adaptive governance to respond to emerging threats such as climate change, pollution, and geopolitical risks, while emphasizing the role of community and indigenous knowledge to strengthen inclusivity and legitimacy.

By embedding economic considerations, research, and international cooperation within its structure, the IBEG framework supports Namibia's ability to build resilient marine ecosystems, reduce dependency on fossil fuels, and develop low-carbon, inclusive maritime sectors. Ultimately, adopting the IBEG framework

helps Namibia operationalize a secure and sustainable ocean economy that is well-aligned with national green growth strategies and global sustainability standards. To strengthen the proposed restorative action-oriented plans, **Figure 5** illustrates a synthesis of the expert-driven recommendations—linking offshore renewable energy, marine waste management, and community empowerment into a circular and integrated governance model.

This interconnected approach ensures that environmental, economic, and social priorities are not treated in isolation. For instance, green energy development reduces maritime carbon emissions, while effective marine waste management protects ecosystems and supports conservation-based enforcement. Community empowerment enhances inclusivity, ensuring that small-scale fishers and coastal populations contribute to and benefit from blue economy initiatives. All these elements converge into the IBEG framework, which offers a strategic, cross-sectoral platform to align spatial planning, resource monitoring, and policy coordination. In doing so, it reinforces maritime security through improved surveillance, enforcement, and stakeholder engagement—key pillars for safeguarding Namibia's marine resources. Ultimately, adopting the IBEG framework supports Namibia's ability to pursue a sustainable, inclusive, and resilient ocean economy aligned with its green economy goals and international sustainability standards.

4. Conclusions

The findings of this study present critical implications for Namibia's transition to a green economy through enhanced maritime security frameworks, aligning with the principles of a sustainable ocean. A sustainable ocean is one that is "productive", "resilient", "inclusive", and "governed" effectively to balance economic growth with environmental and social well-being. These four interlinked principles—derived from the theoretical foundation of sustainable ocean governance and environmental resilience outlined in Section 3—served as the thematic lens through which this study's results were analyzed and interpreted.

A productive ocean requires Namibia to enhance its marine spatial planning and fishery management. Although Namibia's waters are abundant in marine resources, their sustainability is under serious threat from illegal, unreported, and unregulated (IUU) fishing. This research addressed a key knowledge gap by evaluating the specific enforcement and governance weaknesses undermining resource regeneration. By proposing AI-driven surveillance, strategic impact assessment (SIA), stronger policy enforcement, and inclusive support for small-scale fisheries, this study contributes to an actionable framework for restoring marine productivity [29].

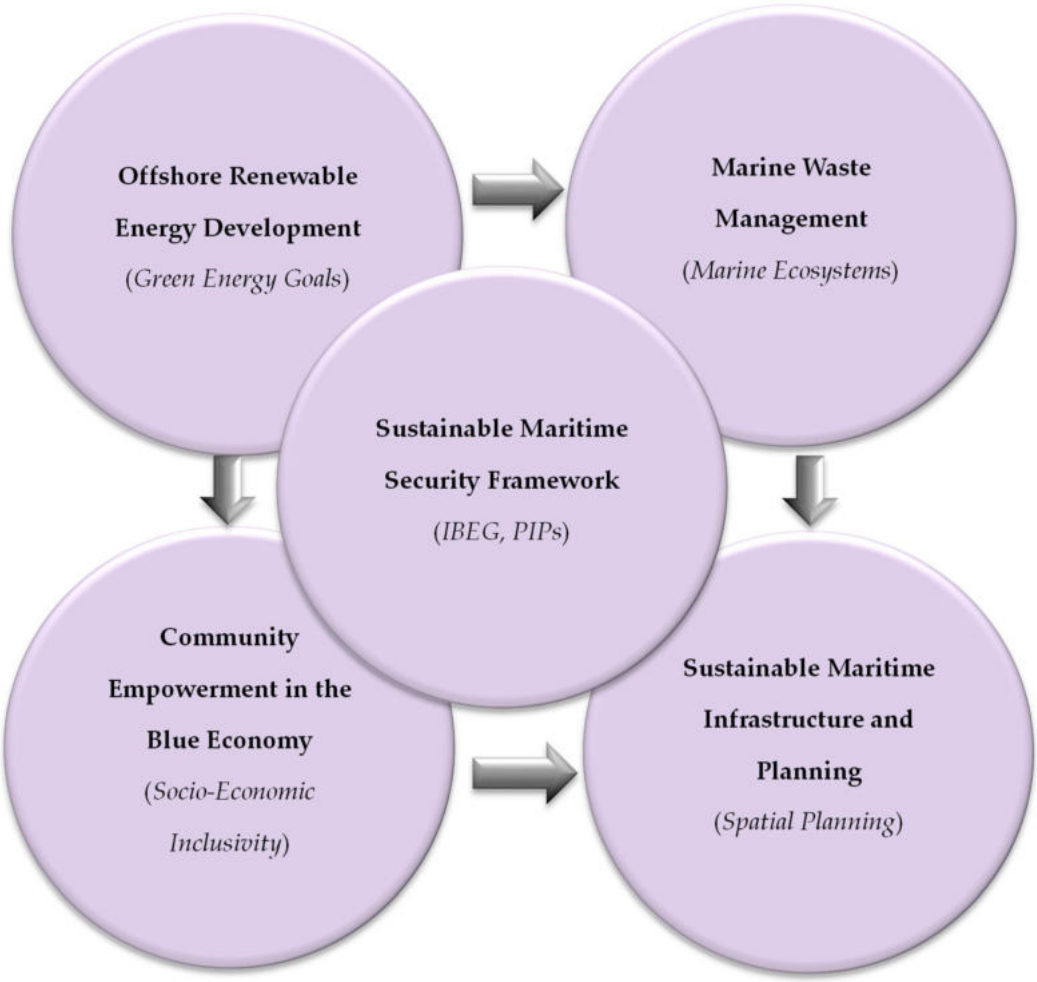

Figure 5 • Blue economy governance (BEG) framework for ocean sustainability.

A resilient ocean necessitates robust responses to marine pollution and climate change. Section 4 revealed alarming trends—rising sea temperatures, habitat degradation, and plastic pollution—that directly challenge ecological integrity. Building on the theoretical lens of environmental sustainability, this study demonstrated how Namibia can strengthen resilience through a circular economy model, investing in waste-to-energy technologies and offshore renewables. These recommendations align with objective 2 of this study: to assess the role of marine pollution control and climate-smart solutions in maritime security.

An inclusive ocean emerged as a critical theme by focusing on social equity in ocean governance. A major contribution of this research was addressing the underrepresentation of coastal communities and small-scale operators in policy frameworks—a gap identified in Section 1. Drawing from social inclusivity theories and participatory governance, the findings stress the need for training, financing, gender empowerment, and indigenous knowledge integration. This directly answers objective 3, which sought to explore social participation within Namibia's maritime policy landscape.

A governed ocean underscores the importance of coherent and technologically advanced maritime governance. Although Namibia has made notable strides—reflected in existing policies such as the blue economy policy and marine spatial planning framework—this research uncovered persistent challenges in enforcement, interagency coordination, and digital capacity. This study addressed these gaps by advocating for AI integration, real-time monitoring, and international collaboration. This aligns with the governance theory discussed in Section 3 and reinforces objective 1: to analyze the coherence and operational effectiveness of Namibia's maritime security frameworks.

Overall, this study concludes that maritime security through ocean governance is a fundamental pillar of Namibia's sustainable ocean economy, directly influencing environmental conservation, economic resilience, and social inclusion. By returning to the theoretical underpinnings of integrated ocean governance and environmental resilience, the research has contributed new insights into the operationalization of sustainability principles in a maritime context. The key takeaways are the following:

1. Productive ocean—Reinforce fishery governance through technology and equity-focused support.
2. Resilient ocean—Implement circular economy strategies and invest in offshore renewables.
3. Inclusive ocean—Empower communities via participatory governance and local capacity building.
4. Governed ocean—Strengthen policy coherence with digital tools and cross-sectoral cooperation.

Therefore, the intersection of maritime security and the blue economy underscores a critical need for integrated policy approaches that align economic ambitions with environmental stewardship. This study's findings affirm that without coherent policies, strong enforcement mechanisms, and inclusive stakeholder collaboration, marine-based economic activities may intensify ecological degradation instead of promoting sustainable development. Strengthening maritime security is not solely about safeguarding territorial waters—it is also about protecting marine ecosystems, ensuring equitable access to ocean resources, and enabling resilient local economies.

The broader implication is that Namibia's transition to a green economy must position maritime security as both a driver and an enabler of sustainable marine development. This requires embedding security within the broader frameworks of climate resilience, equity, and governance reform. A successful approach demands cross-sectoral policy harmonization, community engagement, and adaptive governance structures that reflect the complexity of ocean economies. By doing so, Namibia can not only close the gap between policy and practice but also strengthen its leadership in inclusive and resilient blue economy development.

Future research should explore the economic viability of offshore renewables, the operational impact of AI-driven maritime surveillance, and the socio-economic outcomes of inclusive blue economy policies. Evaluating the effectiveness of regional maritime collaborations could further enhance Namibia's ocean governance model. By aligning its maritime security with the core principles of a sustainable ocean, Namibia can bridge policy–practice gaps and emerge as a leader in resilient and inclusive blue economy development.

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Institutional review board statement

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (Ethics Committee) of Namibia University of Science and Technology (protocol code NUST-2023-0427, approved on 2023 Nov 15).

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