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Exploring Sustainable Finance Practices Toward Building A Resilient Blue Economy In The MENA Region: Opportunities, Challenges, And Policy Recommendations

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Abstract:
The Blue Economy is emerging as a vital pillar of sustainable economic growth and climate resilience across the Middle East and North Africa (MENA) region. With vast marine resources and strategic coastlines, countries such as the United Arab Emirates, Saudi Arabia, Oman, Kuwait, Bahrain, Egypt, Morocco, and Algeria are seeking to leverage ocean-based industries for economic diversification and environmental stewardship. However, critical challenges—including the absence of adequate financial instruments, fragmented policy frameworks, and limited investment de-risking mechanisms—continue to hinder the region's capacity to unlock the full potential of the Blue Economy.
This research examines the role of sustainable finance in building a resilient Blue Economy in the MENA region. Using a mixed-method approach that integrates qualitative case study analysis and quantitative investment trend data, the study investigates the deployment of innovative financial tools such as blue bonds, green Sukuk, impact investing, and blended finance. These instruments are enabling investment flows into marine biodiversity conservation, sustainable fisheries, offshore renewable energy, and climate-resilient maritime infrastructure.
Findings reveal varying levels of ESG integration across the region, with some countries advancing policy innovation while others face regulatory and institutional bottlenecks. The study proposes strategic policy recommendations, including the need for harmonized blue finance frameworks, enhanced public-private partnerships, and capacity-building initiatives.
Furthermore, the research highlights the strategic role of Higher Education Institutions (HEIs) in advancing interdisciplinary knowledge, financial innovation, and policy engagement. This paper contributes to the regional policy discourse by offering actionable insights to strengthen sustainable ocean resource management and foster long-term economic and ecological resilience.
Keywords: *ustainable Finance, Blue Economy, Impact Investing, MENA Region, Climate Resilience, Marine Conservation, Blended Finance, Financial Innovation, ESG Investment, Ocean-Based Industries, Maritime Logistics.*

1. INTRODUCTION

The concept of the blue economy has emerged as a transformative framework that promotes the sustainable utilization of ocean resources while preserving marine ecosystems and enhancing social equity. The World Bank (2017) defines the blue economy as the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems." The scope of the blue economy spans a wide range of ocean-related activities, including sustainable fisheries and aquaculture, maritime transport and logistics, coastal and marine tourism, renewable ocean energy (such as offshore wind and wave energy), marine biotechnology, and ecosystem services such as carbon sequestration and shoreline protection (FAO, 2022; OECD, 2016). Globally, ocean-based industries contribute over USD 2.5 trillion annually to the global economy and support over 31 million jobs, with projections suggesting this value could double by 2030 under sustainable development pathways (OECD, 2016; UNEP, 2021).

The Middle East and North Africa region stands at a critical juncture, facing multifaceted challenges exacerbated by climate change, economic disparities, and geopolitical complexities, necessitating a paradigm shift towards sustainable development models, particularly within its blue economy (Otman, 2021; Stein et al., 2013). The blue economy, encompassing economic activities related to oceans, seas, and coastal areas, holds immense potential for fostering economic growth, creating jobs, and enhancing food security in the MENA region but is increasingly vulnerable to environmental degradation and resource depletion (Farahmand et al., 2023). Sustainable finance emerges as a critical enabler, channeling investments towards projects and initiatives that promote the sustainable use of marine resources, mitigate environmental risks, and enhance the resilience of coastal communities (Bădîrcea et al., 2021). However, the region faces significant hurdles in attracting and deploying sustainable finance effectively, including

limited awareness of blue economy investment opportunities, inadequate regulatory frameworks, and a lack of capacity for developing bankable blue economy projects.

Unlocking the potential of the blue economy in the MENA region requires a concerted effort to promote sustainable finance practices that align economic development with environmental stewardship. This entails fostering a deeper understanding of the blue economy concept, its potential benefits, and the associated environmental risks among policymakers, investors, and the public (Voyer et al., 2018). Governments must play a proactive role in creating enabling regulatory environments that incentivize private sector investment in sustainable blue economy projects, such as renewable energy, sustainable aquaculture, and eco-tourism.

In the Middle East and North Africa (MENA) region, the blue economy holds significant but underutilized potential. Countries such as Egypt, Morocco, Algeria, Saudi Arabia, the United Arab Emirates, Oman, Kuwait, and Bahrain possess strategic coastlines along the Mediterranean Sea, Red Sea, and Arabian Gulf, offering opportunities for marine trade, coastal infrastructure development, sustainable tourism, desalination, and renewable energy projects (UNESCWA, 2022; World Bank, 2021). For instance, the UAE has developed major maritime clusters in Dubai and Abu Dhabi, while Morocco has advanced its "Halieutis" strategy to promote sustainable fisheries and aquaculture. However, MENA's marine and coastal zones face increasing environmental pressures, including rising sea levels, coral reef degradation, overfishing, habitat destruction, and pollution from oil, plastics, and untreated wastewater (UNEP/MAP, 2020; El Dahan et al., 2021).

The integration of sustainable finance into blue economy strategies is critical to addressing these challenges and unlocking investment potential. Sustainable finance refers to financial activities that consider environmental, social, and governance (ESG) criteria to promote long-term economic and environmental sustainability. Financial instruments such as blue bonds, green and blue Sukuk, impact investing, blended finance mechanisms, and ESG-aligned funds are increasingly recognized as key tools to mobilize capital for ocean-based sectors (UN Global Compact, 2021; EIB, 2022; WWF, 2021). Blue bonds, for instance, have been successfully used by countries such as Seychelles and Belize to finance marine conservation and debt-for-nature swaps, offering models for replication in the MENA context (Herr et al., 2019).

Despite growing interest, MENA countries face substantial barriers in financing the blue economy. These include policy incoherence, lack of harmonized regulatory frameworks, insufficient de-risking mechanisms for private investment, limited technical expertise, and a nascent culture of ESG-aligned investment in ocean-related sectors (UNDP, 2022; DLA Piper, 2023). Addressing these issues requires a coordinated approach that blends financial innovation, regulatory reform, and multi-stakeholder collaboration. In addition, Higher Education Institutions (HEIs) can play a pivotal role in capacity building, policy engagement, and knowledge transfer to support the development of sustainable blue economy strategies.

This study aims to examine the role of sustainable finance in building a resilient blue economy across selected MENA countries. The key research questions guiding this paper include:

- What sustainable finance instruments are currently utilized or emerging in the MENA region to support the blue economy?
- What opportunities and constraints exist in mobilizing capital for marine-based projects in MENA?
- What policy and institutional reforms are needed to enhance financial flows and de-risk investments in the blue economy?

To address these questions, the paper adopts a mixed-method approach that combines case study analysis of selected MENA countries with a review of policy frameworks, financial trends, and stakeholder interviews. The structure of the paper is as follows:

- Section 2 provides a review of global and regional literature on sustainable finance and blue economy practices.
- Section 3 outlines the research methodology and data sources.
- Section 4 explores the current blue economy landscape in the MENA region.
- Section 5 presents sustainable finance mechanisms applicable to ocean-based industries.
- Section 6 discusses key opportunities and challenges based on case study findings.
- Section 7 proposes policy recommendations for improving the integration of sustainable finance into blue economy strategies.
- Section 8 concludes with implications for regional development and future research.

2. LITERATURE REVIEW

2.1 Conceptual Framework of the Blue Economy and Sustainable Finance

The blue economy refers to the sustainable use of ocean resources for economic growth, improved livelihoods, and preservation of marine ecosystems (World Bank, 2017). Its conceptual foundation is built upon the integration of ecological and economic objectives, emphasizing inclusive and climate-resilient growth in marine and coastal sectors (OECD, 2016). Key sectors include fisheries, maritime transport, renewable marine energy, coastal tourism, and marine biotechnology.

Sustainable finance, meanwhile, denotes financial flows—both public and private—that integrate environmental, social, and governance (ESG) factors to promote long-term sustainable development (UNEP FI, 2018). Within the blue economy, sustainable finance provides critical capital through instruments such as blue bonds, green and blue Sukuk, impact investing, and blended finance, aiming to align financial systems with ocean sustainability (EIB, 2022; WWF, 2021).

Together, these concepts form a framework where finance acts as a catalytic enabler for achieving blue growth, while ensuring the ecological integrity of marine ecosystems (UN Global Compact, 2021).

2.2 International Experiences: Blue Finance in Action

Several pioneering initiatives offer valuable lessons. In 2018, the Seychelles issued the world's first sovereign blue bond, raising USD 15 million to support marine protected areas and sustainable fisheries. The project was backed by the World Bank and the Global Environment Facility, demonstrating how blended finance can mitigate investor risk (World Bank, 2018).

Indonesia has taken a policy-led approach through its Blue Economy Framework (2021), which integrates marine spatial planning, biodiversity conservation, and inclusive economic development. It outlines investment strategies in fisheries, ecotourism, and marine education, supported by multilateral institutions (UNDP Indonesia, 2021). These cases underscore the potential of coordinated policies and financial innovation in achieving sustainable ocean development.

2.3 Alignment with the Sustainable Development Goals (SDGs)

The blue economy directly supports several Sustainable Development Goals (SDGs), particularly:

- SDG 14: *Life Below Water* – focuses on conserving and sustainably using oceans, seas, and marine resources.
- SDG 13: *Climate Action* – addresses resilience and adaptive capacity to climate-related hazards, relevant to coastal communities.

Sustainable finance is essential for achieving these goals by closing the funding gap in marine sectors (UN, 2015). However, SDG 14 remains one of the least funded goals globally, accounting for less than 1% of philanthropic ocean funding (OECD, 2020), highlighting the urgent need to scale blue finance mechanisms.

2.4 MENA-Specific Literature: Coastal Economies, Marine Pollution, Ocean Governance

The MENA region, with over 18,000 km of coastline, holds vast blue economy potential. According to UNESCWA (2022), MENA's coastal sectors—including ports, desalination, fisheries, and tourism—can serve as engines of economic diversification. However, the region faces mounting pressures from marine pollution, coastal erosion, overfishing, and limited ocean governance frameworks (UNEP/MAP, 2020).

Literature by El Dahan et al. (2021) and Sadek and Fattah (2019) highlights the vulnerability of Mediterranean and Gulf coastlines to climate-induced risks, exacerbated by urbanization and poor marine spatial planning. Moreover, institutional fragmentation and lack of integrated marine policies hamper the ability to design coherent sustainable finance strategies (DLA Piper, 2023).

2.5 Research Gaps and Relevance to the MENA Context

Despite growing global literature on sustainable finance and the blue economy, there is a noticeable gap in empirical research and case studies from the MENA region. Most existing studies focus on high-level overviews or national plans, with limited exploration of how financial instruments are being practically deployed in ocean-based sectors (UNDP, 2022).

There is also limited academic engagement on the role of Shariah-compliant finance—such as green or blue Sukuk—despite their high relevance in Islamic finance-dominated economies in MENA. Furthermore, the role of Higher Education Institutions (HEIs) in capacity building, policy engagement, and financial modeling for blue finance remains underexplored.

This research addresses these gaps by offering regional case studies, identifying practical financial tools, and proposing tailored policy recommendations to strengthen the sustainable blue economy in the MENA region.

3. METHODOLOGY

3.1 Research Design

This study adopts a mixed-methods research design, integrating both qualitative and quantitative elements to provide a holistic understanding of sustainable finance practices in supporting the Blue Economy within the MENA region. The mixed-methods approach enables triangulation of data from diverse sources—policy documents, case studies, and statistical reports—thereby enhancing the validity and depth of findings (Creswell & Plano Clark, 2018).

At the core of the analysis is a comparative case study approach (Yin, 2014), which allows for a cross-national examination of sustainable finance tools and blue economy strategies in selected MENA countries: the United Arab Emirates, Saudi Arabia, Oman, Bahrain, Kuwait, Egypt, Morocco, and Algeria. These countries were selected based on geographic diversity, strategic marine resources, and evidence of blue economy initiatives or sustainable finance engagement.

3.2 Data Sources

The research draws upon a blend of primary and secondary data sources, ensuring a robust empirical base. These include:

- Policy Documents: National development plans (e.g., UAE Blue Economy Platform, Morocco's Halieutis Strategy), ESG regulatory guidelines, and Ministry of Finance and Environment reports.
- Case Studies: Project-level analyses of blue bonds, green Sukuk, blended finance initiatives, and marine conservation programs, drawn from country-specific developments.
- Expert Interviews: Semi-structured interviews with policymakers, financial regulators, sustainability consultants, and marine economy experts from academia and regional institutions. Interviewees were selected through purposive sampling and provided insights into institutional frameworks and investment challenges (Bryman, 2016).
- Secondary Data: Reports and datasets from World Bank, UNEP, UNDP, FAO, and UNESCWA were analyzed to assess trends in blue economy investment, ESG financing, and marine sustainability metrics.

3.3 Analytical Framework

To systematically evaluate the opportunities and challenges of sustainable finance in blue economy development, the study applies a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis. This framework is suitable for exploratory studies as it synthesizes internal capabilities and external contextual factors affecting policy and finance deployment (Gürel & Tat, 2017).

Additionally, PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) analysis was applied to assess macro-level factors influencing sustainable marine investments in the MENA region. This dual-framework approach allows for both institutional and environmental dimensions to be captured, aligning with the complex interdependencies of sustainable finance and ocean governance (Ginter et al., 2013).

3.4 Criteria for Assessing Sustainable Finance Instruments in the Blue Economy Context

The evaluation of sustainable finance instruments is based on a multidimensional set of criteria adapted from UNEP FI (2021), OECD (2020), and WWF (2021). These include:

1. Environmental Impact: Contribution to marine conservation, biodiversity, and pollution reduction (aligned with SDG 14 indicators).
2. Financial Additionality: The ability of the instrument to mobilize capital that would not have been invested otherwise.
3. Risk Mitigation Capacity: Presence of mechanisms such as credit guarantees, blended finance, or insurance to reduce investor risk.
4. Alignment with ESG Standards: Degree to which the instrument adheres to recognized sustainability disclosure frameworks (e.g., ICMA Green Bond Principles, TCFD).
5. Policy Integration: Extent of alignment with national development plans, blue economy strategies, and climate policies.
6. Scalability and Replicability: Potential to be expanded or adapted across other sectors or regions.

This framework supports a systematic and policy-relevant evaluation of the effectiveness and potential of financial instruments to support ocean-based sustainable development in the MENA region.

4. Blue Economy Landscape in the MENA Region

4.1 Overview of Key Sectors: Fisheries, Aquaculture, Ports, Tourism, Renewable Marine Energy, Desalination

The MENA region, with over 18,000 km of coastline spanning the Mediterranean Sea, Red Sea, and Arabian Gulf, has a diverse and strategically significant marine economy. However, the development of the blue economy in the region remains uneven, shaped by differences in national priorities, governance structures, and ecological conditions (UNESCWA, 2022).

Fisheries and aquaculture are foundational in several MENA countries, both for domestic consumption and export. Egypt is Africa's leading aquaculture producer, contributing over 75% of the continent's total output (FAO, 2020). Morocco has implemented the *Halieutis Strategy*, improving the sustainability and economic performance of its fisheries, while Mauritania relies heavily on foreign fishing licenses for national revenue (World Bank, 2021).

Ports and maritime transport play a vital role in trade facilitation and blue infrastructure development. Key hubs include Tangier-Med (Morocco), Port Said and the Suez Canal (Egypt), Jebel Ali (UAE), Port Sultan Qaboos (Oman), and Tripoli (Lebanon). These ports are not only economic gateways but also potential nodes for sustainable logistics and decarbonized shipping (OECD, 2020; ESCWA, 2022).

Coastal and marine tourism is a high-value sector in Tunisia, Morocco, Egypt, and Lebanon, especially along the Mediterranean, and in the UAE and Oman along the Arabian Gulf and Indian Ocean. This sector has shown resilience post-COVID but risks unsustainable growth that could degrade marine habitats (UNEP/MAP, 2020).

Renewable marine energy is in its early stages. Egypt and Morocco have begun offshore wind potential assessments, while Oman and Saudi Arabia are exploring floating solar and wave energy prototypes to integrate into coastal zones (IRENA, 2022). The UAE has potential for tidal energy due to its narrow straits and strong current flows (Masdar, 2021).

Desalination is central to water security in GCC countries. Saudi Arabia, UAE, Kuwait, Qatar, and Bahrain collectively operate over 50% of the world's desalination capacity. However, brine discharge and energy consumption pose serious ecological challenges, particularly in the semi-enclosed Arabian Gulf (Lattemann & Höpner, 2008; Al-Sayed et al., 2022).

4.2 Economic Contribution and Ecological Pressures

The economic footprint of the blue economy in MENA is significant, though underreported. Egypt's aquaculture and port sectors contribute over 5% of national GDP, while Morocco's seafood exports reached USD 2 billion in 2022 (FAO, 2022; World Bank, 2022). The UAE's maritime economy contributes about 7% to GDP through logistics, offshore hydrocarbons, and coastal real estate (MOCCAE, 2021).

Despite this, marine ecosystems across the region are under stress. Key ecological pressures include:

- Overfishing: Particularly acute in Libya, Tunisia, and Mauritania, where regulation is weak, and IUU (Illegal, Unreported, and Unregulated) fishing is widespread (Sadek & Fattah, 2019).
- Marine Pollution: The Mediterranean Sea receives vast quantities of untreated wastewater and plastic waste, with Egypt and Lebanon among the top contributors due to population pressures and limited infrastructure (UNEP/MAP, 2020).
- Habitat Loss: Coastal reclamation for tourism and port development is threatening coral reefs in Saudi Arabia, UAE, and Bahrain, and seagrass beds in Tunisia and Algeria.
- Climate Change: Rising sea levels and seawater intrusion are impacting Delta regions in Egypt, low-lying cities in Libya, and coastal aquifers in Morocco (El Dahan et al., 2021).

4.3 Regional Initiatives and Multilateral Frameworks

Several initiatives attempt to address the fragmented state of marine governance in MENA:

- BlueMed Initiative: This Mediterranean-wide platform promotes research, innovation, and blue jobs. Egypt, Tunisia, and Algeria are active participants, collaborating with EU states (BlueMed, 2021).
- ROPME (Regional Organization for the Protection of the Marine Environment): Coordinating Gulf countries, ROPME supports biodiversity conservation, pollution monitoring, and coral reef protection (ROPME, 2020).

- Arab Strategy for the Protection of the Marine Environment (2020–2030): Adopted by the League of Arab States, it emphasizes integrated coastal zone management, marine spatial planning, and data-sharing among Arab countries (LAS, 2020).
- UNESCWA Blue Economy Programme: Launched to support MENA countries in developing sustainable marine policies, investment frameworks, and public-private collaboration (UNESCWA, 2022).

Despite these frameworks, cooperation remains limited due to institutional silos, funding gaps, and weak enforcement mechanisms.

4.4 Country-Level Overview of Blue Economy Development in MENA

Country	Blue Economy Focus
UAE	Blue Economy Strategy 2021–2031; ports, desalination, innovation, marine R&D (MOCCAE, 2021)
Saudi Arabia	NEOM's coastal smart city projects; Red Sea biodiversity reserves; desalination (Vision 2030)
Oman	Eco-tourism, offshore aquaculture, and integrated port development (UNDP, 2022)
Kuwait	Focus on port expansion and desalination, but no explicit blue strategy yet (ESCWA, 2022)
Qatar	Marine biodiversity programs, desalination, and limited fisheries reform (Qatar EPA, 2021)
Bahrain	Coral reef protection, aquaculture expansion, and desalination sustainability (ROPME, 2020)
Egypt	Suez Canal economy, aquaculture leadership, and Lake Manzala rehabilitation (World Bank, 2022)
Morocco	Halieutis Strategy, marine spatial planning, sustainable fisheries, port expansion (FAO, 2020)
Tunisia	Marine tourism, coastal protection, BlueMed cooperation (BlueMed, 2021)
Algeria	Coastal infrastructure, marine research institutions, pollution control (UNEP, 2021)
Lebanon	Coastal pollution mitigation, BlueMed participation, limited marine finance (UNEP/MAP, 2020)
Libya	Post-conflict degradation, unmanaged fisheries, marine pollution challenges (Sadek & Fattah, 2019)
Mauritania	Fisheries licensing, marine biodiversity, offshore partnerships with EU (FAO, 2022)
Palestine	Coastal water contamination, Gaza marine livelihoods at risk (UNEP, 2021)
Syria	Limited capacity due to conflict; coastal zone degradation (UNEP, 2021)
Jordan	Aqaba's marine park and blue tourism on the Red Sea (ESCWA, 2022)

This review highlights the diverse starting points of MENA countries in blue economy development, underscoring the need for regional cooperation, knowledge exchange, and tailored financial tools.

5. Sustainable Finance Mechanisms for the Blue Economy

Sustainable finance is a crucial enabler for unlocking the economic and ecological potential of the blue economy. Mobilizing capital for marine-based sectors requires a variety of financial instruments and partnerships that incorporate environmental, social, and governance (ESG) considerations, while managing the inherent risks and long-term horizons of ocean-related projects. The following subsections explore key mechanisms increasingly used globally and in emerging economies, with an emphasis on their relevance and application in the MENA region.

5.1 Green and Blue Bonds

Green bonds are debt instruments used to raise funds for environmentally sustainable projects. They are well-established in global markets and are increasingly being adapted to marine sectors. A subset of these instruments, blue bonds, are explicitly designed to finance projects that support the conservation and sustainable use of ocean and water resources (World Bank, 2018).

A landmark example is the Seychelles' Blue Bond, issued in 2018, which raised USD 15 million to support sustainable fisheries and marine protected areas. It demonstrated the potential of blended finance—combining donor support and private capital—to attract investments in marine sustainability (World Bank, 2018; Herr et al., 2019).

In the MENA region, green bonds have been issued in countries such as Egypt, Morocco, and the UAE, but most have focused on renewable energy and infrastructure rather than ocean sectors (UNEP FI, 2021). The development of blue bonds in MENA remains at an early stage, though Morocco and the UAE have begun exploring frameworks for issuing marine-focused bonds under ICMA and CBI principles (UNDP, 2022).

Challenges for blue bonds in the region include the lack of marine project pipelines, weak credit enhancement mechanisms, and inadequate disclosure of ocean-related ESG impacts (WWF, 2021).

5.2 Blended Finance and Impact Investing

Blended finance refers to the strategic use of concessional public finance to attract private sector investment in sustainable development projects. This approach is well-suited to de-risking early-stage or long-term ocean investments (OECD, 2020). For example, marine conservation efforts that do not yield immediate returns can be supported through blended structures that include grants, guarantees, or subordinated debt.

Impact investing, on the other hand, involves investments made with the intention of generating positive, measurable social and environmental impact alongside financial returns. In the context of the blue economy, impact funds are increasingly targeting sustainable aquaculture, marine plastics recycling, eco-tourism, and nature-based coastal protection (GIIN, 2022).

Globally, blended finance has been successfully applied in Belize's debt-for-nature swap, where USD 364 million in debt was restructured to channel funds into marine conservation (The Nature Conservancy, 2021). In the MENA region, however, blended finance for blue projects remains underutilized. A recent UNESCWA (2022) study notes the absence of coordination between sovereign funds, DFIs (Development Finance Institutions), and ministries of environment and finance in building such vehicles.

Public-private blended structures could play a pivotal role in scaling investments in coral reef restoration (e.g., Red Sea region), resilient port infrastructure, and marine biodiversity in Gulf countries—especially when aligned with national vision plans like Saudi Vision 2030 and UAE's Green Growth Strategy.

5.3 Islamic Finance for Marine Sustainability

Islamic finance—governed by principles of risk-sharing, ethical investment, and prohibition of interest (riba)—offers promising tools to fund sustainable marine projects, particularly in Muslim-majority countries. Instruments like Sukuk (Islamic bonds) can be structured to support blue economy sectors such as fisheries, maritime transport, and water infrastructure.

A Green Sukuk issued by Indonesia in 2018 is a precedent for Islamic sustainability financing, raising over USD 1.25 billion for renewable energy and environmental protection (IIFM, 2020). Although not marine-specific, it shows the adaptability of Sukuk to ESG frameworks.

In the GCC and wider MENA region, interest in Blue Sukuk is rising. Conceptually, Sukuk al-Ijara or Sukuk al-Mudarabah could be deployed to finance fisheries cold chain infrastructure, aquaculture farms, and eco-ports in line with Shariah and environmental goals (Al Suwaidi & Ahmed, 2023).

However, operationalizing this requires:

- Marine asset identification that complies with Shariah criteria,
- Standardized green and blue Sukuk frameworks,
- Rating and certification mechanisms based on ESG and Maqasid al-Shariah.

Islamic finance institutions such as the Islamic Development Bank (IsDB) can play a facilitative role in capacity-building and standardization.

5.4 ESG Investing and Ocean-Related Disclosures

ESG investing has evolved from niche to mainstream, with over USD 40 trillion in global assets under management incorporating ESG criteria as of 2022 (Bloomberg Intelligence, 2022). In the blue economy context, ESG investing involves:

- Screening investments based on ocean-related environmental impact,
- Ensuring sustainable livelihoods for coastal communities (social),
- Upholding transparency and regulatory compliance (governance).

Disclosure frameworks are essential to support ESG investing. Global standards such as the Task Force on Climate-related Financial Disclosures (TCFD), the EU Taxonomy for Sustainable Activities, and the Sustainable Blue Economy Finance Principles developed by UNEP FI are guiding institutions on ocean-related material risks (UNEP FI, 2021).

In the MENA region, ESG disclosure is gaining traction. The UAE, Saudi Arabia, and Egypt have introduced ESG guidelines for listed companies, but marine-related disclosures remain absent. Integrating ocean-specific risk metrics—such as marine biodiversity loss, ocean acidification, and pollution footprints—into ESG frameworks is essential for blue finance alignment (UNEP, 2021).

Furthermore, financial institutions in MENA are not yet signatories to the UNEP FI Sustainable Blue Economy Finance Principles, a gap that underscores the need for regional engagement in global sustainability standards.

5.5 Public-Private Partnerships and Philanthropic Finance

Public-private partnerships (PPPs) are critical for financing large-scale infrastructure and innovation in marine sectors. They can blend government backing with private sector efficiency, particularly in ports, coastal tourism, desalination, and marine research (Ghosh & Nanda, 2020). In MENA, PPPs have been employed in UAE's Hamriyah desalination plant, Saudi Arabia's Red Sea eco-tourism project, and Morocco's port modernization program (ESCWA, 2022).

Philanthropic finance, though underutilized, can play a complementary role by:

- De-risking early-stage marine technology pilots,
- Supporting community-based marine protected areas,
- Funding blue economy incubators or academic centers of excellence (OECD, 2020).

Initiatives such as the Blue Nature Alliance and Bloomberg Philanthropies' Vibrant Oceans Initiative globally show how philanthropy can scale marine finance. In the MENA region, philanthropic contributions remain largely ad hoc and focused on general environment or water sectors, rather than targeted blue economy development.

Unlocking philanthropic capital in MENA will require ecosystem-building: tax incentives, outcome-based funding models, and stronger university-NGO collaborations (Kassab & Al-Khatib, 2021).

6. Opportunities In Advancing Sustainable Blue Finance In Mena

The transition toward a sustainable blue economy in the MENA region is not only necessary for ecological resilience but also offers a strategic opportunity for economic diversification, employment generation, and regional cooperation. As nations across the region articulate national visions and green development strategies, blue finance emerges as a critical enabler. The following subsections identify key opportunity areas in unlocking blue finance potential.

6.1 Untapped Marine Sectors with Investment Potential

Many marine-based sectors in the MENA region remain under-capitalized or excluded from mainstream financial portfolios. The following areas represent high-potential investment avenues:

- Sustainable Aquaculture: Egypt, Algeria, and Morocco have extensive coastlines and growing demand for seafood. Investment in modern aquaculture systems—e.g., recirculating aquaculture systems (RAS), offshore cages, and integrated multi-trophic aquaculture—can boost supply while reducing ecological strain (FAO, 2020).
- Eco-Marine Tourism: Coastal zones in Oman, Tunisia, and Jordan's Aqaba region offer biodiversity-rich marine parks ideal for eco-tourism models with minimal environmental footprints. These can attract ESG-conscious investors and build local livelihoods (UNEP/MAP, 2020).
- Marine Transport Decarbonization: MENA hosts strategic ports—e.g., Suez Canal, Jebel Ali, Tangier Med—that can benefit from investments in green port infrastructure, LNG-fueled vessels, and marine electrification (ESCWA, 2022).
- Blue Biotechnology: Algal biomass, marine-derived pharmaceuticals, and bioplastics are emerging as high-value areas. Morocco, Tunisia, and Lebanon have research institutions capable of incubating these innovations (OECD, 2020; UNDP, 2022).

These sectors align with global trends in the "blue acceleration"—a surge in economic activity in marine space—where sustainability-driven growth can be financed through targeted instruments (Jouffray et al., 2020).

6.2 Emerging Innovation: Blue Tech, Carbon Capture, and Nature-Based Solutions

Blue tech innovation is reshaping marine sector financing by creating new markets in monitoring, conservation, and climate resilience:

- Marine Robotics and AI: Autonomous underwater vehicles (AUVs), drones, and AI-powered sensors are being used for oceanographic research, pollution detection, and fisheries management (Gentry et al., 2020). These innovations are gaining interest in UAE and Saudi marine research programs.
- Ocean-Based Carbon Capture: Emerging technologies like macroalgae farming and artificial upwelling systems can sequester CO_2 and contribute to climate mitigation (GESAMP, 2019). Morocco and Oman have shown interest in coastal blue carbon programs under UNEP's Blue Carbon Initiative.
- Nature-Based Solutions (NbS): Mangrove restoration in UAE, Bahrain, and Qatar; coral reef conservation in Red Sea nations; and dune stabilization in North African coasts offer climate adaptation potential while enabling carbon credit markets (UNEP, 2021; IUCN, 2022).

The convergence of digital innovation and marine conservation opens opportunities for venture capital, climate finance, and impact funds targeting blue technologies.

6.3 Regional Cooperation and Financing from Development Banks

While blue finance in MENA remains nascent, multilateral institutions and regional development banks are expanding their mandates to include marine investments:

- The Islamic Development Bank (IsDB) has launched sustainability Sukuk programs that could be adapted for marine infrastructure and aquaculture (IIFM, 2020).
- The Arab Fund for Economic and Social Development (AFESD) and Arab Monetary Fund (AMF) have scope to support blue economy projects aligned with member country priorities, especially for fisheries and port development (ESCWA, 2022).
- The European Bank for Reconstruction and Development (EBRD) has invested in green ports in Egypt and Morocco and is actively exploring blue finance frameworks (EBRD, 2022).

Moreover, platforms like the BlueMed Initiative and ROPME offer cooperation on marine research, biodiversity, and joint investment planning. Enhanced regional coordination on marine spatial planning, policy harmonization, and joint financing vehicles could enable cross-border blue value chains.

6.4 Institutional Readiness and Investor Appetite

There is a growing institutional awareness of the importance of integrating blue economy strategies within MENA development agendas:

- Central banks and financial regulators in UAE, Egypt, and Saudi Arabia have issued ESG reporting frameworks and green taxonomy consultations, though few directly address ocean sectors (UNEP FI, 2021).
- Sovereign wealth funds, such as Abu Dhabi's Mubadala and Saudi Arabia's PIF, have climate and ESG mandates, which could be leveraged for sustainable port, aquaculture, or desalination investments (PIF, 2022).
- Private equity and infrastructure funds are showing increased interest in ESG-aligned coastal infrastructure, especially if supported by concessional finance, blended structures, and standardized disclosure protocols (GIIN, 2022).

Nonetheless, institutional constraints remain: data scarcity, limited ESG capacity in marine agencies, and weak blue bond markets reduce investor confidence. Bridging these gaps requires capacity-building and technical assistance for bankable project pipelines (World Bank, 2022).

6.5 Integration with National Visions Across MENA Countries

Blue finance opportunities are increasingly being integrated into national economic visions across MENA, offering policy alignment and institutional momentum:

- Saudi Arabia (Vision 2030): Includes the Red Sea Project, NEOM's Oxagon port, and Green Initiative, aiming to promote marine tourism, smart ports, and coral conservation (Vision 2030 KSA, 2021).
- UAE (Green Growth Strategy & Centennial 2071): Envisions leadership in blue innovation, marine research, and desalination technology, including the UAE Blue Economy Strategy 2021–2031 (MOCCAE, 2021).
- Egypt (Vision 2030): Prioritizes sustainable aquaculture, Suez Canal expansion, and coastal water management through the National Water Resources Plan 2037 (Egypt Vision 2030, 2021).
- Morocco (Plan Halieutis, Morocco Vision 2030): Integrates marine spatial planning, sustainable fisheries, and blue tourism into national growth pillars (FAO, 2020).
- Oman (Vision 2040): Emphasizes diversification through blue sectors—eco-tourism, ports, aquaculture—under its Blue Economy Implementation Plan (UNDP, 2022).
- Qatar (National Vision 2030): Focuses on marine ecosystem health, desalination innovation, and integrated coastal zone planning (Qatar General Secretariat for Development Planning, 2020).
- Tunisia, Algeria, Lebanon, and Jordan: Have referenced marine conservation, fisheries sustainability, and port modernization in their national adaptation plans and economic reforms (UNESCWA, 2022).

Aligning blue finance strategies with these national visions ensures policy coherence, enhances investor confidence, and increases access to multilateral and climate-related funds.

7. Challenges And Barriers

Despite the significant promise of the blue economy in the MENA region, various systemic, institutional, financial, and environmental barriers hinder the effective mobilization of sustainable finance. These

challenges span national and regional dimensions, requiring both policy reforms and structural innovations to unlock the potential of blue finance for long-term ecological and economic resilience.

7.1 Policy Fragmentation and Weak Regulatory Frameworks

A major impediment to sustainable blue finance in the MENA region is the fragmentation of ocean governance and the lack of an integrated marine policy framework. Most countries manage marine and coastal zones through disconnected agencies, including ministries of environment, transport, fisheries, and tourism, leading to overlapping mandates and policy silos (UNEP/MAP, 2020; Sadek & Fattah, 2019).

Unlike the EU, which has implemented the Integrated Maritime Policy (IMP) and Marine Strategy Framework Directive, no MENA country has a fully operational Marine Spatial Planning (MSP) system (UNESCO-IOC, 2022). This results in uncoordinated coastal development, inefficient permitting processes, and suboptimal investment environments for blue finance (UNESCWA, 2022).

Moreover, environmental laws in the region often lack specific clauses addressing marine ecosystem services, sustainability-linked investment obligations, or penalties for marine degradation, particularly in emerging sectors like aquaculture or offshore renewables (ESCWA, 2022).

7.2 Lack of Data and Marine Asset Valuation

Reliable data and valuation of marine natural capital are foundational for designing investment-ready blue economy projects. Yet, the absence of ocean-related economic data, especially regarding ecosystem services such as carbon sequestration, fisheries productivity, and tourism-linked biodiversity, severely limits project pipeline development (UNEP FI, 2021; World Bank, 2022).

Natural capital accounting frameworks remain underdeveloped in most MENA countries, and marine biodiversity is rarely included in national accounts or climate disclosures (TEEB, 2020). For instance, while Egypt and Morocco have begun integrating water accounting, marine-specific data—such as the economic value of coral reefs or mangroves—remains undocumented (UNDP, 2022).

The lack of spatial and environmental baseline data, such as ocean temperature, salinity, pollution loads, and biodiversity indices, also constrains marine spatial planning and limits credit risk assessment for marine investments (UNESCO-IOC, 2022).

7.3 Climate Change Impacts and Geopolitical Tensions

The MENA region is particularly vulnerable to climate change-induced marine stressors. Coastal zones are experiencing sea-level rise, saline intrusion, coastal erosion, and coral bleaching, all of which undermine the viability of ocean-dependent sectors (El Dahan et al., 2021; IUCN, 2022). Gulf countries like Bahrain and Qatar, with low-lying urban coastlines, are at high risk of flooding and infrastructure damage.

Additionally, the region's exposure to geopolitical tensions—including conflict in Libya and Syria, maritime disputes in the Eastern Mediterranean, and strategic chokepoints such as the Strait of Hormuz and Suez Canal—introduces macro-risk volatility, deterring long-term private sector investment in marine infrastructure (World Bank, 2021; Sadek & Fattah, 2019).

Climate and geopolitical uncertainty increase the cost of capital for marine projects and complicate insurance, risk pooling, and contingency planning—key features for investor confidence in blue finance (OECD, 2020).

7.4 Limited Financial Instruments Tailored to the Blue Economy

While green finance has gained traction in MENA—particularly through green bonds and ESG funds—the development of blue-specific financial instruments remains extremely limited. As of 2023, no country in MENA has issued a sovereign blue bond, and few marine-linked green Sukuk have been developed despite their alignment with Islamic finance principles (Al Suwaidi & Ahmed, 2023; UNEP FI, 2021).

Several barriers contribute to this underdevelopment:

- Absence of blue investment taxonomies
- Lack of certified pipeline projects with ocean impact indicators
- Limited experience with outcome-based finance or debt-for-nature swaps

Furthermore, microfinance and SME finance are not well-integrated with marine livelihoods (e.g., artisanal fisheries, small-scale aquaculture), reducing inclusivity in blue economic transitions (ESCWA, 2022).

7.5 Low Awareness Among Financial Institutions and Policymakers

There is a significant awareness and capacity gap among regional banks, investment authorities, and government agencies regarding the blue economy. Marine ecosystem services, such as coastal protection,

nutrient cycling, and habitat provision, are often invisible to finance ministries and investors, who are more familiar with terrestrial and energy-based sustainability metrics (TEEB, 2020).

Most regional banks and sovereign wealth funds have not signed the UNEP FI Sustainable Blue Economy Finance Principles or adopted ESG criteria specific to ocean-based investments (UNEP FI, 2021). In a 2022 ESCWA survey, less than 20% of MENA financial institutions reported familiarity with blue economy financing concepts.

This lack of familiarity affects deal structuring, risk assessment, ESG integration, and investor outreach, leading to underdevelopment of this thematic investment area. Moreover, policymakers and legislators lack access to case-based knowledge and guidelines to develop enabling regulatory environments (UNDP, 2022).

Summary of Challenges vs. Potential Solutions

1. Challenge: *Policy fragmentation and weak regulatory frameworks*

Solution: Establish integrated national and regional Blue Finance frameworks, supported by Marine Spatial Planning (MSP) and coordinated inter-ministerial ocean governance bodies.

2. Challenge: *Lack of data and marine asset valuation*

Solution: Invest in natural capital accounting, marine ecosystem service valuation, and regional data-sharing platforms to support evidence-based investment decisions.

3. Challenge: *Climate change impacts and geopolitical tensions*

Solution: Embed climate adaptation and resilience planning in marine investment strategies, develop marine risk insurance, and include geopolitical risk assessments in blue infrastructure financing.

4. Challenge: *Limited financial instruments tailored to the blue economy*

Solution: Create dedicated financial products such as blue bonds, blue Sukuk, debt-for-nature swaps, and blended finance structures to unlock capital for ocean-based projects.

5. Challenge: *Low awareness among financial institutions and policymakers*

Solution: Launch capacity-building programs, create blue finance literacy toolkits, and institutionalize multi-stakeholder dialogues (including regulators, investors, and academia).

Policy Map: Linking Blue Economy Challenges to SDG 14 & Climate Finance

[Challenge] ——▶ [SDG 14 Target] ——▶ [Climate Finance Instrument]

1. Policy Fragmentation
   ▶ SDG 14.2: Protect and restore ecosystems
      ▶ Marine Spatial Planning, GEF grants

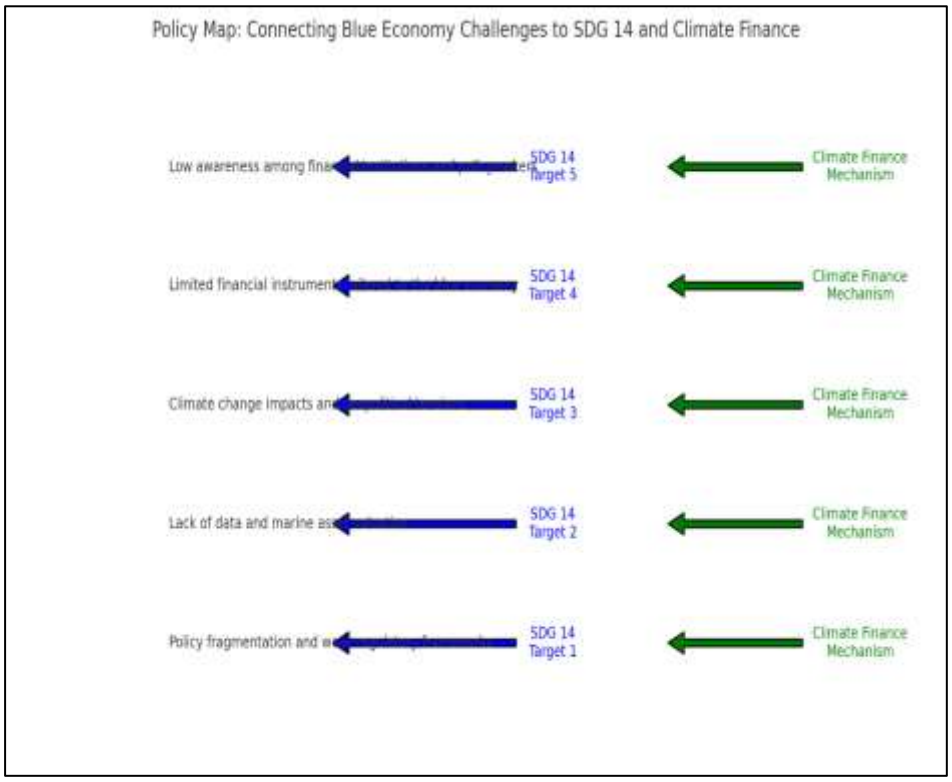
2. Lack of Marine Valuation
   ▶ SDG 14.7: Sustainable use of marine resources
      ▶ Natural Capital Accounting, Blue Carbon Markets

3. Climate/Geo-risks
   ▶ SDG 14.5: Marine protected areas
      ▶ Green Climate Fund, Adaptation Fund, Risk Insurance

4. Financial Instrument Gaps
   ▶ SDG 14.A: Access to marine tech and science
      ▶ Blue Bonds, Blue Sukuk, Impact Funds

5. Awareness & Capacity
   ▶ SDG 14.C: Implement international law
      ▶ Technical Assistance, UNEP FI Blue Finance Principles

This map illustrates how each challenge aligns with a specific SDG 14 target and how it can be addressed through relevant climate finance instruments or policy tools. These connections are crucial for crafting coordinated national strategies and attracting international blue finance.



8. Policy Recommendations

In response to the challenges outlined, this section presents policy recommendations to operationalize sustainable blue finance in the MENA region. These recommendations emphasize strategic planning, regulatory reform, stakeholder engagement, and innovation—all aligned with regional priorities and global sustainability targets such as SDG 14 (Life Below Water) and the UN Decade of Ocean Science for Sustainable Development (2021–2030).

8.1 Developing National and Regional Blue Finance Frameworks

The creation of national and regional blue finance frameworks is essential to mainstream the blue economy within financial markets, development plans, and climate policy. These frameworks should:

- Define eligible blue sectors and activities (e.g., sustainable fisheries, desalination, eco-tourism, offshore renewables).
- Establish criteria for blue bonds, blue Sukuk, and blended finance.
- Include ESG impact metrics specific to marine assets.

Countries like Indonesia, Portugal, and Seychelles have developed national blue finance strategies integrated into their ocean policies (World Bank, 2018; UNEP FI, 2021). MENA countries can replicate these models by working through regional platforms such as UNESCWA, ROPME, and BlueMed to harmonize frameworks and attract cross-border investments (ESCWA, 2022).

Blue finance frameworks should also be integrated into national climate strategies (NDCs), SDG implementation plans, and ocean governance policies to enhance alignment and policy coherence (UNDP, 2022).

8.2 Creating Enabling Environments for Private Sector Investment

To attract private capital, governments must create predictable, transparent, and risk-mitigated investment environments. Key steps include:

- Establishing marine investment promotion units within economic ministries or blue economy authorities.
- Offering de-risking instruments (e.g., partial credit guarantees, political risk insurance, revenue floors for marine infrastructure projects).
- Introducing blue investment taxonomies and disclosure guidelines, such as those developed by the EU Blue Economy Finance Framework (European Commission, 2022).

Public-private partnerships (PPPs) should be expanded to include climate-aligned marine sectors, such as carbon-neutral ports, resilient tourism zones, and smart aquaculture systems. Regulatory clarity and streamlined licensing processes for marine ventures will be crucial (Ghosh & Nanda, 2020).

Additionally, MENA governments should use sovereign wealth funds (e.g., PIF in Saudi Arabia, Mubadala in UAE) to crowd-in private sector finance into long-term marine investments (PIF, 2022).

8.3 Capacity Building for Blue Finance Literacy

There is an urgent need for blue finance literacy across financial institutions, regulators, academia, and policymakers. Capacity-building initiatives should include:

- Executive training programs on sustainable marine investment for central banks, development banks, and ministries of finance.
- Curriculum integration of blue economy finance into business, environmental, and public policy education, particularly at Higher Education Institutions (HEIs) in the region (Kassab & Al-Khatib, 2021).
- Online certification courses and toolkits by institutions such as UNEP FI, the World Bank, and the Global Blue Finance Initiative.

Multi-stakeholder platforms, such as regional blue finance forums and public-private dialogues, can serve to raise awareness, share best practices, and co-design solutions tailored to the MENA context (UNEP FI, 2021; UNDP, 2022).

8.4 Aligning Policies with SDG 14 and the UN Decade of Ocean Science

To enhance global legitimacy and financing access, MENA countries should align national marine strategies and blue finance frameworks with SDG 14 targets and the UN Decade of Ocean Science for Sustainable Development (2021–2030). This alignment can:

- Unlock multilateral finance from climate funds (e.g., Green Climate Fund, GEF, Adaptation Fund).
- Support the development of marine science research networks and data-sharing platforms.
- Facilitate participation in blue carbon markets, biodiversity offsets, and payment-for-ecosystem-services (PES) schemes (IUCN, 2022; UNEP, 2021).

National governments should adopt science-based targets for ocean protection (e.g., protecting 30% of marine areas by 2030) and incorporate them into marine spatial planning, blue bond frameworks, and ESG reporting standards (TEEB, 2020).

8.5 Encouraging Innovative Funding Mechanisms

To diversify capital sources and expand inclusion, MENA countries should adopt innovative financing instruments such as:

- Outcome-based finance, including blue development impact bonds that disburse funds based on verified results (UNDP, 2022).
- Debt-for-nature swaps, particularly in high-debt coastal countries like Egypt or Tunisia, in partnership with multilateral banks (The Nature Conservancy, 2021).
- Blue crowdfunding platforms for community-based projects (e.g., coral reef restoration, marine debris cleanup).
- Green and blue Sukuk linked to ocean health KPIs, following Islamic finance principles (Al Suwaidi & Ahmed, 2023).

Innovative finance mechanisms can be supported through public blue finance accelerators, incubators, and matching grants to help small and medium enterprises (SMEs) develop scalable, bankable blue economy solutions (GIIN, 2022).

9. **CONCLUSION**

This research underscores the vital role of sustainable finance in shaping a resilient blue economy in the MENA region. The study identifies significant barriers, including fragmented regulatory systems, a lack of ocean valuation data, and limited blue financial instruments. However, it also reveals strong potential in emerging sectors such as aquaculture, eco-tourism, blue technology, and Islamic finance innovations.

For policymakers, the findings advocate for the creation of national and regional blue finance frameworks, integrated with marine spatial planning and aligned with SDG 14. For investors, the paper highlights the importance of de-risking strategies, ESG metrics, and marine-aligned blended finance tools. Academics are encouraged to lead interdisciplinary research and capacity development initiatives.

The research contributes to the regional discourse on climate resilience by positioning ocean-based investments as a catalyst for environmental sustainability and inclusive development. Future research should prioritize empirical case studies on blue bonds, ESG criteria for marine assets, and Islamic finance models tailored to ocean sustainability.

9.1 Summary of Key Findings

This study explored the role of sustainable finance mechanisms in developing a resilient blue economy across the MENA region, a geopolitically and ecologically diverse area with vast yet underutilized marine potential. Key findings reveal that while global best practices—such as blue bonds (Seychelles, Belize), blended finance, and blue carbon markets—are increasingly being adopted in other regions (World Bank, 2018; The Nature Conservancy, 2021), the MENA region is still at a nascent stage in embedding these tools into national marine strategies.

Five principal barriers constrain blue finance development in the region: fragmented policy environments, insufficient marine data, climate and geopolitical risks, limited marine-specific financial instruments, and low awareness among financial institutions and regulators (UNEP FI, 2021; ESCWA, 2022). At the same time, significant opportunities exist, including untapped marine sectors (e.g., aquaculture, blue tourism), emerging innovation (e.g., blue tech, ocean-based carbon capture), and alignment with national visions such as Saudi Vision 2030 and Egypt Vision 2030 (MOCCAE, 2021; Vision 2030 KSA, 2021).

9.2 Implications for Policymakers, Investors, and Academics

For policymakers, the findings underscore the urgency of creating integrated blue finance strategies, building regulatory coherence, and embedding marine priorities into broader economic development and climate resilience frameworks (UNDP, 2022). Governments should also institutionalize marine spatial planning, natural capital accounting, and ESG marine finance principles.

Investors—both institutional and impact-oriented—must be engaged through risk-reducing mechanisms (e.g., guarantees, sovereign funds), and incentivized to participate in blue sectors through clear taxonomies, disclosure standards, and marine investment vehicles (OECD, 2020; UNEP, 2021). Blended finance models, blue Sukuk, and debt-for-nature swaps offer pathways to mobilize capital at scale.

For the academic and research community, the study offers a foundation to develop cross-disciplinary curricula, conduct marine-focused valuation studies, and support policy advocacy. Higher Education Institutions (HEIs) in the region have a key role to play in knowledge transfer, research innovation, and building blue finance literacy (Kassab & Al-Khatib, 2021).

9.3 Contribution to Sustainable Development and Climate Resilience in MENA

By linking sustainable finance to marine sustainability, this study contributes to a holistic approach to achieving SDG 14 (Life Below Water) and broader climate adaptation goals. The proposed policy and financial mechanisms promote inclusive, low-carbon, and biodiversity-conscious economic growth, in alignment with the UN Decade of Ocean Science for Sustainable Development (2021–2030) (UNESCO-IOC, 2022; UNEP, 2021).

The study also highlights the intersections between climate finance, ocean governance, and national development—providing a framework for integrating marine ecosystems into national climate strategies, NDCs, and SDG roadmaps. This integration will be essential for enhancing resilience of coastal communities, safeguarding marine biodiversity, and fostering sustainable livelihoods.

9.4 Suggestions for Future Research

Future research should focus on:

- Empirical case studies of blue finance implementation in MENA (e.g., small-scale fisheries finance in Egypt or blue carbon credits in UAE).
- Comparative studies on blue bond performance, particularly in relation to green bond markets in emerging economies.
- Development of marine ESG metrics tailored to MENA's ecological and economic context.
- Exploration of Islamic finance applications in ocean conservation and infrastructure, particularly through blue Waqf or Zakat-based marine funds (Al Suwaidi & Ahmed, 2023).
- Assessment of regional cooperation models, including the role of GCC, League of Arab States, and UNESCWA in cross-border marine finance initiatives.

Additionally, advancing interdisciplinary collaboration between marine science, finance, and public policy schools in regional HEIs will be essential to cultivate future blue finance leaders and institutions.

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