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Exploring the Potential of the Blue Economy: A Systematic Review of Strategies for Enhancing International Business in Bangladesh in the context of Indo-Pacific Region

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ABSTRACT

This systematic review **aims** to provide a methodical analysis of the Blue Economy in the Indo-Pacific region, particularly from the perspective of Bangladesh, focusing on its growth trajectory, key stakeholders, policy frameworks, technological advancements, trade and investment trends, as well as challenges and opportunities for international business expansion. The **methods** employed a comprehensive search of electronic databases, and inclusion and exclusion criteria were applied to identify relevant studies for analysis. The **results** revealed that from 2000 to 2020, the Blue Economy sectors of the country, such as fisheries, aquaculture, maritime transportation, and tourism, saw notable development. International development agencies, corporations, academic institutions, governments, and civil society organizations are some of the major players in Blue Economy projects. The policy frameworks that facilitate the development of the Blue Economy include integrated ocean management, blue growth initiatives, maritime security and governance, and resilience and adaptation to climate change. Innovation and expansion in the Blue Economy sectors have been fueled by technological breakthroughs, such as autonomous underwater vehicles, renewable energy projects, remote sensing technologies, and marine biotechnology. Rising demand for sustainable goods and services, technical advancement, and regional collaboration have all contributed to an increase in trade and investment in Blue Economy industries internationally. The **study concludes** that there is significant potential for the Blue Economy in the Indo-Pacific region to drive economic growth, promote social progress, and ensure environmental sustainability. However, challenges such as regulatory complexity, access to finance, inadequate infrastructure, and environmental degradation need to be addressed to fully realize this potential. Addressing these challenges requires coordinated efforts from governments, businesses, academia, civil society organizations, and international development agencies, along with a focus on sustainable and inclusive development practices.

Keywords: Blue Economy; ocean economy; Indo-Pacific region; Bangladesh; growth trajectory; sustainable development goals; technological advancements; trade trends; investment trends; international business; environmental management

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ОРИГИНАЛЬНАЯ СТАТЬЯ

Изучение потенциала голубой экономики: систематический обзор стратегий развития международного бизнеса в Бангладеш в контексте Индо-Тихоокеанского региона

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АННОТАЦИЯ

Целью данного систематического обзора является глубокий анализ голубой (синей) экономики в Индо-Тихоокеанском регионе, в частности, в Бангладеш. Особое внимание уделяется траектории роста голубой экономики, ключевым заинтересованным сторонам, политическим концепциям, технологическим достижениям, тенденциям в торговле и инвестициях, а также вызовам и возможностям для расширения международного бизнеса. **Методы** исследования включали комплексный поиск в электронных базах данных с применением критериев включения и исключения для выявления релевантных научных публикаций для анализа. **Результаты** показали, что с 2000 по 2020 г. в секторах голубой экономики страны, таких как рыболовство, аквакультура, морской транспорт и туризм, наблюдалось заметное развитие. Международные агентства развития, корпорации, академические институты, правительства и организации гражданского общества являются одними из основных участников в проектах голубой экономики. Политические концепции и инструменты, способствующие развитию голубой экономики, включают комплексное управление океаном, инициативы «голубого роста», морскую безопасность и управление, а также устойчивость и адаптацию к изменению климата. Инновациям и развитию в секторах голубой экономики способствовали технологические прорывы, такие как автономные подводные аппараты, проекты возобновляемых источников энергии, технологии дистанционного зондирования и морские биотехнологии. Растущий спрос на экологически чистые товары и услуги, технический прогресс и региональное сотрудничество — все это способствовало увеличению торговли и инвестиций в отрасли голубой экономики на международном уровне. В исследовании делается **вывод** о значительном потенциале голубой экономики в Индо-Тихоокеанском регионе для стимулирования экономического роста, содействия социальному прогрессу и обеспечения экологической устойчивости. Однако для полной реализации этого потенциала необходимо решить такие проблемы, как сложность регулирования, доступ к финансам, неадекватная инфраструктура и деградация окружающей среды. Решение этих проблем требует скоординированных усилий со стороны правительств, бизнеса, научных кругов, организаций гражданского общества и международных агентств развития, а также сосредоточения внимания на практиках устойчивого и инклюзивного развития.

Ключевые слова: голубая экономика; экономика океана; Индо-Тихоокеанский регион; Бангладеш; траектория роста; цели устойчивого развития; технологические достижения; торговые тенденции; инвестиционные тенденции; международный бизнес; природопользование

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1. Introduction

The 21st century has witnessed a paradigm shift in global economic discourse, with increasing recognition of the pivotal role oceans play in sustainable development. The Blue Economy (BE) is a paradigm that aims to use marine resources to promote economic development while also prioritizing environmental sustainability and social equality [1–3]. Amidst changing geopolitical dynamics and environmental difficulties, governments are exploring different methods to achieve economic success. The Indo-Pacific Region has become one of the key areas for the development of BE projects [4–6]. The BE idea spans a wide range of economic sectors and activities, including fisheries, aquaculture, renewable energy, marine biotechnology, and coastal tourism [7, 8]. The focus is on promoting the responsible and long-term use of ocean resources, implementing management strategies that take into account the whole

ecosystem, and incorporating environmental factors into economic planning and decision-making. The BE fundamentally signifies a shift away from conventional methods of using resources towards a comprehensive and all-encompassing strategy that emphasizes long-term sustainability and resilience [9].

Although the Indo-Pacific region is a significant area for the growth of the BE, it is important to acknowledge that Europe, North America, and Latin America also have important opportunities in this field. Based on the Organisation for Economic Cooperation and Development (OECD) data, these regions are significant contributors to the advancement of BE initiatives because of their sophisticated technological capacities, major investments in marine research, and strong legislative frameworks that promote sustainable oceanic activities [10, 11]. Europe has been leading the way with its Blue Growth policy, while North America benefits from substantial innovation and investment in marine industries [12, 13]. Latin America makes substantial contributions to sustainable fishing and marine conservation through its extensive coasts and diverse marine biodiversity [14, 15].

The Indo-Pacific Region extends from the eastern coastlines of Africa to the western coast of the Americas [16, 17]. It includes highly active economies, important maritime routes, and areas with high levels of marine biodiversity. The region's BE growth is influenced by factors such as a fast-rising population, an expanding middle class, and increasing urbanization tendencies. These factors provide both possibilities and problems. The Indo-Pacific region, as identified by the World Bank, encompasses six out of the ten economies with the highest growth rates globally [18–21]. This makes it a significant hub for global trade, investment, and marine commerce [22]. Over the last several years, the Indo-Pacific region has seen a significant increase in BE activities [11, 23]. This growth may be attributed to a combination of causes, such as changes in population patterns, developments in technology, the effects of climate change, and evolving geopolitical dynamics [24, 25]. There is a rising recognition among governments, corporations, and civil society players of the economic potential of the region's marine resources and coastal ecosystems. As a result, there is an increased focus on sustainable development and equitable growth initiatives. This comprehensive literature evaluation aims to investigate the capacity of the BE to enhance international commerce in the Indo-Pacific Region, focusing on Bangladesh, an emerging economy in the region [26–28]. This study seeks to enhance comprehension of how BE concepts might be used to foster economic success, environmental sustainability, and social well-being in the area. It does this by combining previous research, highlighting significant themes, difficulties, and possibilities.

1.1. Contextualizing the Blue Economy in the Indo-Pacific

The Indo-Pacific Region is a large and varied area of marine territory that stretches from the Indian Ocean to the Pacific Ocean. It includes several island countries, coastal states, and important maritime chokepoints. More than 60% of the global population resides in this region, which includes very populated nations such as China, India, Indonesia, and Bangladesh [29]. The region's strategic importance arises from its crucial maritime routes, which enable the transportation of commodities, energy supplies, and information among Asia, Africa, and the Americas [30]. The Indo-Pacific region has significant potential for the BE, owing to its plentiful marine resources, expansive coastline, and advantageous position at the intersection of major global trade routes [31]. The area relies heavily on fisheries and aquaculture as important economic sectors, supporting the lives of millions of people and making substantial contributions to food security and nutrition. The Indo-Pacific region, as reported by the Food and Agriculture Organization (FAO), contributes more than 60% to the total worldwide fish output, establishing its significance in the global seafood industry [32]. Aside from fisheries, the Indo-Pacific region has abundant renewable energy potential, including extensive offshore wind, solar, and tidal resources that are ready to be harnessed. Australia, Japan, and South Korea have made substantial investments in renewable energy infrastructure with the goal of decreasing reliance on fossil fuels and addressing the consequences of climate change [33]. The emergence of offshore wind farms, wave energy converters, and marine biofuel production facilities offers fresh prospects for international corporate cooperation and investment in the area

[34]. The Indo-Pacific region has significant potential for the burgeoning field of marine biotechnology, which has prospects for activities such as bioprospecting, pharmaceutical research, and bioremediation [35]. Coral reefs, mangroves, and marine microorganisms have a vast amount of biodiversity, which has the potential to provide new chemicals and genetic resources that may be used in medicine, agriculture, and industry [36, 37]. Collaborative research endeavors and measures to transfer technology are crucial for realizing the economic worth of marine biotechnology while also guaranteeing fair access and sharing of benefits [38]. Coastal tourism plays a crucial role in stimulating economic development in several Indo-Pacific nations, drawing in millions of tourists annually to unspoiled beaches, coral reefs, and places of cultural significance. Nevertheless, the fast growth of tourist infrastructure and recreational activities presents difficulties for marine ecosystems, such as the deterioration of habitats, pollution, and overuse of natural resources [39]. Sustainable tourism practices, such as the implementation of eco-certification schemes, community-based tourism initiatives, and effective management of marine protected areas, play a crucial role in achieving a harmonious balance between economic growth and environmental protection [40].

The Indo-Pacific Region is susceptible to several maritime security risks, such as piracy, illicit fishing, marine pollution, and transnational organized crime [41]. Inadequate governance systems, conflicts over territory, and geopolitical competitions worsen these difficulties, hindering attempts to advance sustainable BE growth and regional collaboration [42]. To ensure maritime security and maintain peace in the area, it is crucial to improve awareness of maritime activities, enhance law enforcement capacities, and promote discussion and confidence-building measures [43]. Recently, there has been a significant increase in regional cooperation structures and multilateral initiatives in the Indo-Pacific area. These efforts are focused on fostering the growth of the BE and ensuring sustainable ocean governance [44]. The Indian Ocean Rim Association (IORA), the Pacific Islands Forum (PIF), and the Association of Southeast Asian Nations (ASEAN) have all given high attention to marine concerns in their agendas, acknowledging the significance of oceans for economic well-being, food security, and resilience against disasters [45]. The regional forums are central to furthering the BE goal and boosting regional integration by facilitating policy dialogues, exchanging best practices, and mobilizing resources [46].

2. Literature review

2.1. Historical development of the Blue Economy

2.1.1. Early concepts and evolution

The BE has developed over centuries, influenced by humanity's interaction with the oceans and their resources [47–49]. The Phoenicians, Greeks, and Romans, who were ancient maritime civilizations, understood the economic opportunities that the waters offered for trade, fishing, and transportation [50]. Nevertheless, they also recognized the significance of implementing sustainable practices in order to guarantee the enduring sustainability of marine resources [51]. Initial restrictions and traditional practices, such as fishing quotas and seasonal closures, were implemented with the goal of preventing excessive exploitation and preserving ecological equilibrium [52]. The contemporary period has seen a rise in the prominence of the BE due to growing apprehensions regarding overfishing, pollution, and climate change [53]. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) was a crucial development in global initiatives to regulate ocean resources and safeguard marine ecosystems [54]. The United Nations Convention on the Law of the Sea (UNCLOS) created the legal structure for determining maritime borders, exploiting resources, and protecting the environment, providing the basis for effective and sustainable management of the oceans. The significance of the BE in attaining global sustainability has been strengthened by subsequent international accords, including Agenda 21 from the 1992 Earth Summit and the United Nations Sustainable Development Goals (SDGs) of 2015 [55, 56]. The Sustainable Development Goals (SDGs) offer a comprehensive framework for tackling interconnected issues such as poverty, hunger, health, education, gender equality, clean water, energy, economic growth, industry, innovation, inequality, cities, consumption, climate change, oceans, biodiversity, peace, and partnerships [55, 56].

In recent research, there has been a growing emphasis on studying the relationship between the BE and the United Nations' Sustainable Development Goals (SDGs), as well as the agreement among stakeholders regarding this connection [57, 58]. An analysis of literature from 1998 to 2018 shows a significant connection between the BE and SDGs [14–17, 58]. These objectives specifically address topics, such as marine life, terrestrial life, peace, justice, strong institutions, and partnerships for achieving the goals [58]. Stakeholders have expressed a specific inclination towards SDG 3 (Good Health and Well-Being) and SDG 8 (Decent Work and Economic Growth) in relation to the BE, as stated by the OECD in 2020 [56, 58]. The level of stakeholder engagement at the intersection of the BE and SDGs differs depending on the specific circumstances and geographical areas, indicating a range of various objectives and interests [57, 58]. Key stakeholders are crucial in promoting sustainable development goals within the context of the BE. The stakeholders encompass governments, intergovernmental organizations, non-governmental organizations, private sector companies, research institutions, and local communities. Governments have a vital role in developing laws, regulations, and incentives to support the advancement of sustainable ocean management and BE projects [58]. Intergovernmental organizations, such as the United Nations, and regional groups, such as the European Union, promote international collaboration, enhance capabilities, and exchange knowledge regarding the most effective methods in the BE [48, 58]. Non-governmental organizations (NGOs) and civil society groups support and promote environmental conservation, social equity, and human rights as part of the BE agenda [55, 59, 60]. Private sector entities play a crucial role in driving innovation, investment, and entrepreneurship in sectors such as marine technology, renewable energy, and sustainable tourism [61]. Research institutions produce scientific information, carry out evaluations, and offer technical support to facilitate evidence-based decision-making in the development of the BE [62]. Local communities, particularly those who rely on marine resources for basic sustenance, play a crucial role as stakeholders in the management of coastal areas, the regulation of fisheries, and the implementation of ecotourism projects [63].

2.2. Academic and institutional definitions of the Blue Economy

The BE comprises several economic activities associated with the water and coastal areas, such as fisheries, aquaculture, tourism, shipping, renewable energy, and biotechnology. Although the BE encompasses a wide range of activities, there is currently no universally agreed-upon definition for it. However, it is often recognized as a system for advancing sustainable development by utilizing the economic opportunities of the oceans and safeguarding their ecological health.

The BE is frequently described by academic and institutional sources as having multiple dimensions, with a particular emphasis on the interconnections between economic, social, and environmental factors. The BE, as defined by the World Bank, refers to the responsible utilization of ocean resources to promote economic development, enhance people's well-being, and create employment opportunities, all while safeguarding the health of marine ecosystems [58, 64]. The European Union's BE Strategy aims to promote innovation, investment, and collaboration in crucial sectors, such as marine biotechnology, offshore energy, and maritime transport [65]. It is crucial to comprehend the many conceptualizations of the BE in academic study. The study [66] emphasizes the lack of clarity surrounding the term «BE,» since it has frequently been used interchangeably with related concepts, such as «ocean economy» or «marine economy,» without precise definitions. In addition, words such as ocean economy (OE), marine economy (ME), and blue growth (BG) have been used interchangeably in the literature [66]. The use of several terms in this context is a result of the intricate and ever-changing nature of issues related to the BE. Due to regional, sectoral, or disciplinary viewpoints, scholars and practitioners may employ varying terminology, which adds to the diversity of definitions and conceptualizations. Although there are difficulties in defining terms, scholarly studies on the BE are steadily growing, focusing on topics such as governance, sustainability, innovation, and economic development. Researchers seek to enhance comprehension and provide guidance for policy and practice in utilizing the economic capabilities of oceans while simultaneously protecting marine ecosystems and promoting social fairness by analyzing various conceptualizations and techniques.

2.3. Regional trends and Bangladesh economy

Within the specific circumstances of Bangladesh, the BE possesses considerable capacity to stimulate economic expansion and alleviate poverty. Due to its vast coastline, numerous marine resources, and advantageous location in the Bay of Bengal, Bangladesh is in a favorable position to capitalize on the BE. The National Oceanographic and Maritime Institute (NOAMI) of the country plays a vital role in conducting research and formulating policies regarding marine affairs. Additionally, government initiatives such as the Bangladesh Delta Plan 2100 and the BE Cell are focused on fostering sustainable ocean management and promoting maritime development.

There is a shift occurring in the economic environment of the Indo-Pacific area, with an increased emphasis on the interconnection of countries and the trade that takes place in the maritime sector. The focus on BE initiatives has been motivated by increasing apprehensions regarding maritime security and the endeavor for sustainable development. Regional organizations fostering cooperation among member states in the BE encompass the Asia-Pacific Economic Cooperation (APEC) and the Indian Ocean Rim Association (IORA) [67]. The United Nations' SDGs emphasize the need to use marine resources in a sustainable manner. This reflects the global consensus on the significance of the BE in achieving socio-economic objectives.

Due to its extensive coastline and abundant marine resources, Bangladesh is strategically positioned to capitalize on the BE. The fishing sector of the nation sustains the livelihoods of millions of individuals and provides a substantial economic impact. Bangladesh has exhibited its dedication to sustainable utilization of maritime resources through its investments in renewable energy initiatives and offshore gas development [26, 68]. Bangladesh's marine ecosystems face a danger to their sustainability due to factors such as overfishing, pollution, and climate change. These challenges also hinder the country's capacity to fully capitalize on the potential benefits of the BE [69, 70]. To address these challenges and promote sustainable development in the maritime sector, collaborative research and innovative solutions are necessary.

In order to effectively capitalize on the potential of the BE, Bangladesh must actively engage in global collaborative projects. Participation in conferences, such as IORA and APEC, provides opportunities for collaboration with regional and global partners. The study [26] proposes that Bangladesh could enhance its marine commerce and attract foreign investments for BE initiatives through the establishment of trade agreements and knowledge-sharing platforms. The study [71] suggests that Bangladesh's BE plan could be advantageous if it aligns with China's projected Belt and Road Initiative (BRI). This program has the ability to create infrastructure and improve connections in the marine sector.

Europe's extensive technological expertise in BE industries offers opportunities for collaboration with Bangladesh. Collaborative research projects, agreements to transfer technology, and attempts to enhance skills can help facilitate the sharing of knowledge and strengthen links between two parties. Moreover, European investment in Bangladesh's BE infrastructure has the potential to generate employment opportunities and promote sustainable development [43]. The European Union's Blue Growth Strategy focuses on fostering collaborations with third parties and promoting sustainable growth in the marine sector to achieve common objectives [72].

2.4. Analytical context in relation to the SDG framework

The BE is strongly associated with the United Nations SDGs, specifically Goal 14: Life Below Water, which advocates for the preservation and sustainable utilization of ocean resources. The BE can help address poverty, food security, and climate resilience by supporting sustainable fisheries, coastal tourism, and marine renewable energy. This approach can advance multiple SDGs at the same time. However, in order to fully realize the potential of the BE, it is necessary to adopt integrated and inclusive strategies that give priority to environmental sustainability, social equality, and economic viability. The inherent contradictions between these two discussions necessitate solutions that encompass the advantages linked to the maritime economy while acknowledging and tackling its risks. Within the framework of the BE, the SDGs established by the United Nations indicate that

economic progress should be both inclusive and environmentally friendly. They emphasize the importance of achieving a harmonious balance between the economic, social, and environmental aspects of sustainable development in relation to the oceans [58, 73]. The United Nations has designated the period from 2021 to 2030 as the 'Decade of Ocean Science for Sustainable Development' with the aim of aiding endeavors to halt the deterioration of ocean health and unite ocean stakeholders globally under a shared framework. The objective of this framework is to ensure that ocean science can effectively assist governments in establishing better circumstances for the sustainable development of the ocean. The World Bank places significant importance on achieving a balance between the three pillars of sustainable development in the context of oceans, which is a crucial aspect of the BE [58, 74]. The United Nations' SDGs offer a comprehensive framework for addressing global concerns, including those related to the BE. The expansion of the BE and the sustainable governance of marine resources are two objectives that are intricately linked to many SDGs. SDG 14, known as "Life Below Water," centers on the sustainable utilization of seas, oceans, and marine resources [75]. The text advocates for the implementation of measures to safeguard marine and coastal ecosystems, halt marine pollution, and ensure the sustainable management of fisheries and aquaculture. The United Nations in 2015 identified several SDGs that have consequences for the BE. One of the SDGs, specifically SDG 12, focuses on sustainable consumption and production [76]. This goal highlights the importance of reducing marine pollution, addressing the impacts of climate change, and promoting sustainable practices in the use of resources.

Implementation of the SDGs and BE strategies can enhance policy coherence and facilitate integrated approaches to promoting sustainable development in Bangladesh. Bangladesh may effectively track advancements, detect deficiencies, and prioritize measures to attain sustainable outcomes by incorporating SDG indicators into national development strategies and integrating BE objectives into relevant sectors [77]. Incorporating individuals from many sectors, such as the public, commercial, academic, and civil society, into the implementation of the SDGs, can foster a sense of ownership, cooperation, and innovation. This, in turn, can enhance the inclusivity and effectiveness of BE initiatives [8].

2.5. Comparative analysis of Blue Economy strategies adopted by different countries in the region

An examination of BE policies implemented by several nations in the Indo-Pacific region demonstrates a wide range of tactics, goals, and results. Australia and New Zealand have made sustainable fisheries management, marine conservation, and tourist development a top priority in their BE agendas [78]. These nations have adopted fisheries management systems based on quotas, created marine protected areas, and encouraged sustainable tourism practices to conserve marine ecosystems and assist coastal populations. Countries such as Singapore and South Korea have prioritized the development of marine biotechnology, offshore aquaculture, and renewable energy as major components of their BE policies [79]. These nations have made investments in research and innovation centers, technology parks, and regulatory structures to promote the expansion of BE sectors and improve their international competitiveness in developing markets. Small island developing nations (SIDS) in the Pacific, such as Fiji and Samoa, encounter distinctive obstacles and prospects in the advancement of the BE. This is due to their restricted resources, susceptibility to climate change, and reliance on marine resources for sustenance [80]. These nations have given priority to community-based resource management, sustainable tourism, and renewable energy initiatives to encourage the development of an inclusive and resilient BE. Additionally, they are also tackling challenges related to poverty reduction and social fairness (*Table 1*).

3. Methodology

The approach used in this systematic literature review consisted of a thorough search strategy to discover pertinent academic papers, reports, and publications related to the BE in the Indo-Pacific Region. The search was conducted by using electronic databases such as PubMed, Scopus, Web of Science, and Google Scholar. A mix of keywords and Boolean operators was used to achieve a comprehensive search [81]. The search

Table 1
Comparative Analysis of Blue Economy Strategies Adopted by Different Countries in the Region

Country	Blue Economy Strategy	Key Initiatives
Australia	BE Strategic Framework (BESF) focusing on sustainable marine industries, innovation, and economic development.	— Investing in marine research and technology development. — Supporting aquaculture and sustainable fisheries management.
Indonesia	National Action Plan for the BE (NAPBE) emphasizing sustainable fisheries, marine tourism, and coastal community empowerment.	— Strengthening marine conservation and protected areas. — Promoting ecotourism and sustainable coastal development.
Japan	Blue Growth Strategy promoting offshore renewable energy, marine biotechnology, and sustainable fisheries.	— Expanding offshore wind farms and promoting ocean energy technologies. — Enhancing aquaculture production and seafood processing.
Philippines	Philippine Development Plan (PDP) prioritizing marine biodiversity conservation, coastal resilience, and inclusive growth in coastal communities.	— Establishing marine protected areas and sustainable fishing zones. — Supporting small-scale fisherfolk livelihood programs.
Thailand	Thailand 4.0 strategy integrating digital innovation and sustainable development, including smart fisheries management and marine resource conservation	— Implementing digital monitoring systems for fisheries management. — Promoting sustainable aquaculture practices

Source: Developed by the authors based on various national government reports and documents on BE strategies and initiatives.

was refined by using key phrases such as "Blue Economy," "Indo-Pacific," "maritime economy," "ocean resources," "sustainable development," and "international business" in different combinations. By continuously improving the search strategy via preliminary searches and expert input, we were able to optimize it to include relevant material. The articles were chosen according to predetermined criteria for inclusion. These criteria included that the articles had to be published in peer-reviewed journals, conference proceedings, or respected institutional reports. Furthermore, the articles had to particularly address subjects linked to the BE within the Indo-Pacific Region. In addition, papers should include pertinent analysis on the trajectory of development, key players, legislative frameworks, technical breakthroughs, trends in trade and investment, as well as the obstacles and possibilities for expanding international companies. The exclusion criteria were used to exclude publications that were not written in English, those that were not directly related to the BE or the topic of the review, duplicates, or those that did not provide enough information for data extraction. The screening and selection procedure included an initial evaluation based on titles and abstracts to ascertain the relevance of the study to the subject and inclusion criteria. Afterwards, complete publications containing possibly relevant information were obtained and analyzed separately by two researchers to determine their ultimate inclusion in the review. Any inconsistencies were addressed by discussion and agreement among the researchers. The process of data extraction was carried out in a methodical manner, using a pre-established data extraction form to collect essential information from the chosen studies. This information included details such as the author(s), publication year, study technique, principal results, and their relevance to the research aims. Thematic synthesis was used to analyze the literature on the growth trajectory, stakeholders, policy frameworks, technological advancements, trade and investment trends, challenges, and opportunities for international business expansion in the Indo-Pacific BE [82]. This analysis aimed to identify patterns, trends, and gaps in the research. The chosen studies were evaluated for quality us-

ing established criteria that are applicable to their individual methodologiea. This evaluation took into account elements such as the rigor of the methods used, the theoretical framework used, the sources of data, and the transparency of the conclusions. Rigorous studies were accorded more significance in the analysis of findings, whereas research of poorer quality was approached with caution or disregarded if it was judged methodologically flawed. The synthesized data were thematically evaluated to find prominent themes, patterns, and trends within the literature [83]. The findings were analyzed within the framework of the study goals, with an emphasis on comprehending the existing information, pinpointing deficiencies and constraints, and producing valuable insights for future research, policy formulation, and practical applications. The results of the systematic literature review were presented in a well-organized narrative framework, focusing on important themes and subtopics related to the study goals. This was done to make it easier for stakeholders, policymakers, researchers, and practitioners to comprehend and use the findings.

4. Findings and discussion

The systematic literature review yielded valuable insights into various aspects of the BE in the Indo-Pacific region, encompassing its growth trajectory, key stakeholders, policy frameworks, technological advancements, trade and investment trends, as well as challenges and opportunities for international business expansion.

4.1. Growth trajectory

The rise of BE sectors in the Indo-Pacific Region from 2000 to 2020 demonstrates a significant and consistent increase in major sectors, such as fisheries, aquaculture, marine transport, and tourism. The growing trend highlights the region's substantial role in contributing significantly to the worldwide development of the BE. During the span of twenty years, the fisheries and aquaculture industries saw significant development rates, consistently enhancing their contributions to the area economy. Starting with small proportions in 2000, both the fisheries and aquaculture industries have consistently grown, with fisheries increasing from 5% to 25% and aquaculture from 8% to 28% by 2020 [84]. The significant expansion may be attributed to causes such as technical progress, rising demand for seafood products, and favorable regulatory frameworks that encourage sustainable resource management and the development of aquaculture. The Indo-Pacific region's strategic geographic position and function as a significant center for global business have made maritime transit a crucial catalyst for the creation of the BE. The region's significance in enabling international commerce and connection is shown by the steady increase in marine transport, which has grown from 6% in 2000 to 26% in 2020 [85]. The region's role as a significant participant in global marine commerce networks has been strengthened by investments in port infrastructure, shipping logistics, and maritime security. Furthermore, tourism saw steady growth during the given time frame, propelled by enhanced infrastructure, promotional campaigns, and increasing disposable incomes. The region's many natural landmarks, cultural heritage sites, and welcoming amenities have enticed an increasing number of local and global visitors, hence fostering the growth of coastal villages and industries. Overall, the results emphasize the growing importance of the Indo-Pacific region in driving the growth of the BE on a worldwide scale. The continuous expansion in fisheries, aquaculture, marine transport, and tourism highlights the region's capacity to stimulate economic growth, promote social progress, and ensure environmental sustainability by making smart investments and engaging in cooperative efforts in BE sectors.

4.2. Key stakeholders and involvement

The key parties engaged in BE projects in the Indo-Pacific region include governments, corporations, universities, civil society groups, and international development agencies. Tirumala and Tiwari (2022) state that governments have a crucial responsibility in creating policies, legislation, and investment incentives to foster the growth and sustainability of the BE. Several nations in the area have created specialized BE ministries or task forces to facilitate coordination between different agencies and ensure policy consistency across various sectors [87]. Businesses have a crucial role in promoting innovation, investment, and market growth in BE industries. Businesses, ranging from individual fishers to large multinational organizations,

have a vital role in extracting resources, integrating them into the value chain, and gaining access to markets [88]. In the BE, sustainable company practices such as eco-certification, fair trade, and corporate social responsibility are becoming more and more important in order to stay competitive in the market and gain the trust of investors [89]. Academia and research institutions support BE projects by conducting scientific research, developing technology, and providing capacity-building activities [86]. Collaborative research initiatives, information sharing platforms, and training programs facilitate the connection between scientific knowledge gathering and policy implementation, promoting evidence-based decision-making and innovation in BE sectors. Civil society groups are essential in campaigning for environmental protection, social fairness, and community empowerment in BE efforts [90]. NGOs, CBOs, and indigenous peoples' groups often function as monitors, alerting others to the environmental and social consequences of BE operations and promoting sustainable management practices and legislative changes. Upadhyay and Mishra (2020) state that international development agencies, multilateral organizations, and donor agencies provide monetary and technical aid to endorse BE projects and capacity-building programs in the Indo-Pacific region. These organizations use their knowledge, networks, and resources to fill gaps in governance, enhance institutional capacity, and encourage the exchange of information and collaboration across countries in the development of the BE (*Table 2*).

4.3. Policy frameworks

An examination of the policy frameworks that promote the growth of the BE in the Indo-Pacific region has revealed a wide range of strategies designed to encourage economic diversification, innovation, and the creation of employment opportunities. The identified policy areas include integrated ocean management, blue growth initiatives, maritime security and governance, and climate change adaptation and resilience [55]. Integrated ocean management efforts seek to achieve a harmonious equilibrium between the many demands placed on marine resources, with the goal of reducing disputes and fostering sustainable development. These methods often need cooperation across several sectors and collaboration with stakeholders to enable the efficient management and preservation of maritime ecosystems while also supporting economic activity. Blue growth strategies aim to facilitate the sustainable expansion of BE sectors by implementing specific regulations, making strategic investments, and fostering collaborations. These techniques seek to maximize the commercial value of marine resources while ensuring environmental preservation and promoting social inclusiveness. Blue growth initiatives aim to stimulate economic success and job creation in coastal towns by promoting innovation, entrepreneurship, and the development of value chains. Marine security and governance policies are essential for guaranteeing the safety, security, and long-term viability of marine operations in the area. Efforts to improve knowledge of marine areas, bolster law enforcement powers, and encourage collaboration among neighboring countries are crucial in the fight against unlawful activities including piracy, illicit fishing, and maritime pollution. These measures also support the growth of maritime commerce, transportation, and connectivity. Climate change adaptation and resilience policies aim to include climate factors into BE development plans, fostering ecological resilience and community livelihoods in response to climate-related risks and vulnerabilities [91]. These policies have the objective of developing the ability to adjust, improving readiness for disasters, and encouraging sustainable ways for managing resources in order to reduce the effects of climate change on BE sectors and coastal communities (*Table 3*). However, the investigation also identified difficulties with the consistency of policies, the alignment of regulations, and the absence of effective governance, highlighting the need for more coordination and cooperation among all involved. To tackle these problems, it is necessary to coordinate policy goals, simplify regulatory structures, and enhance institutional capabilities in order to promote sustainable and equitable growth of the BE in the Indo-Pacific region.

4.4. Advancements in Blue Technology

Technological innovations play an influential role in driving the expansion of the BE in the Indo-Pacific region. They enable more effective extraction of resources, integration of value chains, and access to markets. Remote

Table 2
Key stakeholders and their involvement in Blue Economy initiatives

Stakeholder	Role
Governments	Formulate policies, regulations, and investment incentives. Coordinate inter-agency efforts.
Businesses	Drive innovation, investment, and market development. Implement sustainable business practices.
Academia	Conduct scientific research, technology development, and capacity-building activities.
Civil Society Orgs	Advocate for environmental conservation, social equity, and community empowerment. Raise awareness and promote sustainable management practices.
International Agencies	Provide financial and technical assistance. Support capacity-building initiatives. Facilitate knowledge sharing and South-South cooperation

Source: Developed by the authors.

Table 3
Policy Frameworks Supporting Blue Economy Development in the Indo-Pacific Region

Policy Framework	Description
Integrated Ocean Management	Balances competing uses of marine resources. Minimizes conflicts. Promotes sustainable development.
Blue Growth Strategies	Promotes economic diversification, innovation, and job creation in BE sectors. Involves public-private partnerships and stakeholder consultations.
Maritime Security and Governance	Enhances maritime domain awareness. Strengthens law enforcement capabilities. Fosters regional cooperation to address maritime security challenges.
Climate Change Adaptation and Resilience	Integrates climate considerations into BE development. Promotes ecosystem resilience and community livelihoods

Source: Developed by the authors.

sensing technologies, such as satellite imaging and aerial drones, allow for the continuous monitoring of maritime conditions, improving fisheries management methods, and aiding in the development of sustainable aquaculture operations [92]. Autonomous underwater vehicles (AUVs) provide accurate data gathering and investigation of marine ecosystems, making significant contributions to scientific study, mineral exploitation, and offshore infrastructure inspection [93]. The development of renewable energy technologies, such as offshore wind turbines and wave energy converters, has favorable prospects for the generation of clean energy and the reduction of carbon emissions in marine transport and coastal infrastructure. Moreover, advancements in marine biotechnology, such as genetic manipulation and the exploration of marine resources, allow for the use of marine creatures in the development of medications, biomaterials, and bioremediation techniques [94]. Nevertheless, despite these favorable circumstances, concerns have been raised regarding the ecological consequences of technological implementation, the sufficiency of regulatory structures to oversee developing technologies, and fair access to technology among various stakeholders [95]. To tackle these challenges, a comprehensive strategy is needed that combines environmental sustainability, regulatory supervision, and inclusive innovation initiatives. Responsible technology deployment involves evaluating and reducing any environmental hazards linked to new technologies integrating sustainability and precautionary principles into the processes of technology development and

deployment. Enhancing regulatory frameworks entails revising current laws and regulations to tackle new challenges brought about by technological progress (*Table 4*). Meanwhile, ensuring fair access to technology involves advocating for the transfer of technology, fostering the development of skills and knowledge, and facilitating the sharing of information among various groups, especially in developing nations and marginalized communities.

4.5. Trade and investment trends

International trade and investment in BE sectors were observed to be on the rise in the Indo-Pacific, driven by growing demand for sustainable products and services, technological innovation, and regional cooperation (*Table 5*). Fisheries and aquaculture products, renewable energy projects, and marine biotechnology innovations were identified as key areas of investment and market growth [96].

Table 4

Technological advancements impacting Blue Economy growth in the Indo-Pacific Region

Technological Advancements	Description
Remote sensing technologies	Enable real-time tracking of fishing vessels. Detection of illegal fishing activities. Assessment of marine habitats.
Autonomous underwater vehicles	Advance scientific research, mineral exploration, and offshore infrastructure inspection.
Renewable energy technologies	Make renewable energy production more cost-effective and scalable. Contribute to energy security and environmental sustainability.
Marine biotechnology innovations	Accelerate discovery and commercialization of novel compounds and genetic resources from marine organisms

Source: Developed by the authors.

Table 5

Trade and investment trends in Blue Economy sectors in the Indo-Pacific

Sector	Key Trends and Drivers	Challenges and Impediments
Fisheries and aquaculture	– Growing demand for sustainable seafood products	– Market access barriers
	– Technological innovation and value chain integration	– Overfishing and resource depletion
	– Regional cooperation and trade agreements	– Environmental degradation and habitat loss
Renewable energy projects	– Shift towards clean energy sources and decarbonization	– Policy and regulatory uncertainties
	– Investment in offshore wind, wave, and tidal energy	– Lack of infrastructure and financing
	– Potential for job creation and economic development	– Social acceptance and community engagement
Marine biotechnology	– Exploration of marine genetic resources for pharmaceuticals	– Intellectual property rights and bioprospecting regulations
Innovations	– Development of biomaterials, biofuels, and bioremediation	– Ethical and cultural considerations
	– Partnerships between academia, industry, and government	– Access to funding and research infrastructure

Source: Developed by the authors.

However, challenges such as market access barriers, socio-economic disparities, and governance issues were identified as potential impediments to realizing the full economic potential of BE sectors in the region [97].

4.6. Challenges and opportunities

The analysis identified a range of difficulties and possibilities for expanding international business in the Indo-Pacific BE. The primary difficulties that need to be addressed are the deterioration of the environment and the effects of climate change [58]. These challenges pose a significant danger to the long-term viability of marine ecosystems and the livelihoods that rely on them. To tackle these difficulties, it is necessary to make collaborative efforts in reducing pollution, overfishing, habitat loss, and other human-caused pressures. Additionally, it is important to adopt policies that help us adapt to the impacts of climate change, including rising sea levels and ocean acidification. Socio-economic inequalities provide a notable obstacle since disadvantaged areas often experience the adverse consequences of BE activities. Promoting fair and equal access to resources, opportunities, and rewards is crucial for building social inclusion and diminishing inequality. Furthermore, deficiencies in governance, such as insufficient enforcement of regulations,

Table 6

Challenges and opportunities for international business expansion in the Indo-Pacific Blue Economy

Aspect	Challenges	Opportunities
Regulatory environment	Complex and inconsistent regulations across countries may hinder international business operations.	Harmonization of regulations and standards could facilitate cross-border trade and investment in BE sectors.
Access to finance	Limited access to financing, especially for small and medium-sized enterprises (SMEs), may constrain business expansion.	Increased availability of investment opportunities, venture capital, and financial support for BE projects and startups.
Infrastructure development	Inadequate infrastructure, such as ports, transportation networks, and energy facilities, may impede business growth.	Investments in infrastructure development could enhance connectivity and accessibility to BE resources and markets.
Technology and innovation	Limited adoption of advanced technologies and innovation may hinder competitiveness and efficiency.	Embracing technology and innovation can lead to increased productivity, cost savings, and new market opportunities in BE sectors.
Market access and trade	Trade barriers, tariffs, and non-tariff measures may restrict market access and hinder international trade.	Bilateral and multilateral trade agreements, as well as regional economic integration, can facilitate market access and promote trade in BE products and services.
Environmental sustainability	Environmental degradation and resource depletion pose risks to long-term business viability and reputation.	Adoption of sustainable practices, eco-certifications, and corporate social responsibility (CSR) initiatives can enhance competitiveness and brand value.
Human capital development	Skills gaps and workforce shortages in specialized areas may limit business growth and innovation.	Investments in education, training, and capacity-building programs can develop a skilled workforce equipped to address the evolving needs of the BE.
Stakeholder engagement	Limited collaboration and coordination among stakeholders may hinder collective action and project implementation	Engaging with diverse stakeholders, including governments, communities, and NGOs, can foster partnerships, knowledge sharing, and social acceptance for BE initiatives

Source: Developed by the authors.

corruption, and insufficient institutional capacity, provide challenges to the efficient administration of the BE and the achievement of sustainable development [59]. Nevertheless, within these difficulties are prospects for global corporate expansion and enduring development. Technological innovation, such as advancements in remote sensing, renewable energy, and marine biotechnology, creates opportunities for using resources, creating value, and developing new markets. Utilizing these advancements may improve productivity, effectiveness, and environmental friendliness in several areas of the BE. The rise in market demand for sustainable goods and services offers an additional opportunity for worldwide company development. Regional collaboration and agreements provide prospects for consolidating resources, exchanging expertise, and synchronizing endeavors to tackle mutual obstacles and use shared prospects. Furthermore, by implementing inclusive business models that prioritize environmental stewardship, social responsibility, and community engagement, businesses can generate shared value for themselves, communities, and ecosystems. By incorporating sustainability principles into their strategies and operations, multinational corporations can contribute to the achievement of sustainable and inclusive BE development in the Indo-Pacific region (*Table 6*).

5. Conclusion

The comprehensive analysis of the BE in the Indo-Pacific area uncovers a dynamic environment marked by many difficulties and possibilities. By examining important data, some noteworthy discoveries have surfaced. The region's potential for economic development is highlighted by the growth trajectory of BE industries such as fisheries, aquaculture, marine transport, and tourism. Nevertheless, this expansion is not devoid of intricacies, as shown by the many obstacles that have been found. The participation of many stakeholders, such as national governments, international organizations, NGOs, and the corporate sector, emphasizes the cooperative endeavors being carried out to advance sustainable BE projects. Policy frameworks are essential for steering these efforts, focusing on ensuring consistency in regulations, promoting the development of infrastructure, and involving stakeholders. Technological innovations play a pivotal role in driving the expansion of the BE by providing creative solutions for managing resources, improving operational efficiency, and accessing markets. Remote sensing technology, autonomous underwater vehicles, and artificial intelligence are important advancements that are influencing the future of maritime sectors in the area. Although there has been progress, there are still notable obstacles to overcome, such as legislative impediments, limited financial availability, and concerns over environmental sustainability. To overcome these problems, it is necessary to maintain ongoing cooperation, investment, and innovation in order to fully exploit the potential of the BE and ensure its sustainability in the long run. Ultimately, the Indo-Pacific region is now at a crucial point in its progress towards a sustainable and inclusive BE, where it has the potential to effectively use its marine resources for development. By using the refined knowledge and frameworks outlined in this comprehensive analysis, those involved may effectively traverse the intricacies of the BE and plan a path towards a more successful and resilient future.

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