

Current Research and Future Perspectives: A Literature Review on the Blue Economy of Indonesia

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Abstract. As an archipelagic country with an ocean-spanning more than two-thirds of its land area, developing a sustainable ocean economy is vital for Indonesia. Indonesia's strategic position has also created opportunities for Indonesia to influence regional political and economic stability and lead in sustainable ocean development. Blue Economy is recognized as disentangling socio-economic activities and advancement from environmental deterioration while maximizing the potential gains from marine resources. This study aims to scrutinize and analyse existing academic literature and research papers and analyse the future perspectives of the Blue Economy in Indonesia, employing VOSviewer to examine the current status and scope—a Systematic Literature Review spanning a decade of academic journal datasets extracted from the Scopus database. A Strategic Foresight approach using secondary data was also employed to highlight potential future scenarios and their implications. By employing strategic foresight and analysing potential future scenarios, the study can provide helpful information for long-term planning and decision-making processes in various sectors of the Blue Economy and their human capital development.

1 Introduction

Indonesia, often portrayed as the world's largest archipelagic nation with its vast expanse of over 17,000 islands, is uniquely positioned at the forefront of marine biodiversity and economic opportunity [1]. These islands are not only representative of the nation's cultural and geographic diversity, but also reservoirs of untapped marine potential. The essence of this potential is briefly captured within the framework of the "blue economy," an emerging global narrative that emphasizes the sustainable use of marine and coastal resources for economic development [2]. In the era of sustainability, where environmental concerns are increasingly intertwined with economic ambitions, the blue economy finds its resonance, especially in countries with a significant ocean footprint such as Indonesia [3].

Indonesia's importance in the global blue economy discourse can hardly be overstated. Its strategic location, bridging the Indian and Pacific Oceans, increases its marine importance,

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impacting not only regional but also global maritime trade and ecology [4]. However, capitalizing on this marine wealth while ensuring that core views of sustainability are not compromised requires a deep understanding of existing scientific knowledge, research trajectories, and the identification of potential gaps that future research can address.

To navigate these vast and often complicated research waters, this bibliographic paper attempts to provide a comprehensive overview of the scholarly literature focused on Indonesia's blue economy. By delving into the myriad of scholarly articles, empirical findings, and analytical insights, this paper aims to present an aggregated panorama of the current research landscape. This Systematic Literature Review (SLR) and Strategic Foresight (SF) study is aimed at exploring the trends in existing scientific publications and analysing the future perspectives of the blue economy in Indonesia. As a country that is surrounded by vast blue waters, Indonesia has the potential to become a major player in the blue economy. Through this study, we aim to shed light on the current state of research on the blue economy in Indonesia and identify potential areas for growth and improvement, especially in the human capital development for the blue economy. The research question that we aim to answer in this study is "What are the current research and future perspectives of blue economy in Indonesia?"

Through a thorough examination of existing literature on the topic, we hope to gain insights into the current state of the blue economy in Indonesia and the potential for its growth and development in the future. By highlighting emerging trends, identifying the gaps in the existing research, and suggesting future perspectives, it hopes to stimulate new academic endeavours, inform policy decisions, and provide stakeholders with a scholarly compass in the ever-evolving maritime realm of Indonesia.

2 Material and Method

2.1 Systematic Literature Review (SLR)

2.1.1 Search Strategy

To ensure a comprehensive and systematic review of the relevant literature, a structured search strategy was employed, showcased in Figure 1. In this study, the VosViewer tool was employed to visualize bibliometric networks and scrutinize the existing literature. It focuses on the Blue Economy of Indonesia to elucidate both current research and prospective directions. The primary data source for this investigation was the Scopus database, from which articles were retrieved using the specific search criteria: "Blue Economy" AND "Indonesia". This search yielded a total of 31 papers directly related to the specified keywords. The initial research data underwent a screening process based on the subsequent criteria: (A) articles that appeared in journals and (B) articles written in English. Subsequently, these data were subjected to an in-depth analysis using the VosViewer to ascertain patterns, themes, and interconnections within the literature corpus. The analytical capabilities of VOSviewer software allowed for the formation of clusters, stipulating a minimum threshold of three articles per cluster. From our dataset of 31 articles, the software discerned and segregated the research into three distinct clusters. This clustering provides a

structured lens to interpret and comprehend the nuances of the Blue Economy discourse within the Indonesian context.

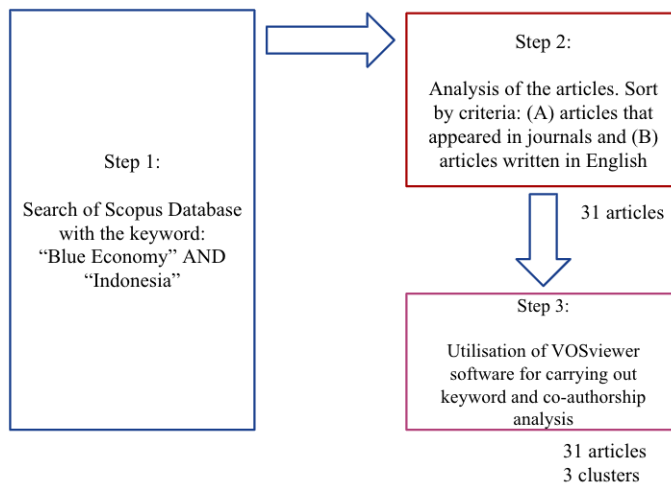


Fig. 1. Stages of Systematic Literature Review

2.1.2 Data Analysis

In our attempt to recognise the central themes underpinning the Blue Economy in Indonesia, we employed keyword co-occurrence and co-authorship analysis. Upon conducting the keyword co-occurrence analysis, we identified several key themes that emerged across the literature. Additionally, the co-authorship analysis highlighted prominent authors and institutions that have contributed significantly to the literature on the Blue Economy in Indonesia. This analysis further revealed potential collaborations and networks within the research community, which could lead to more comprehensive and impactful research in the future.

2.2 Strategic Foresight Analysis

2.2.1 Framework Selection

The Strategic Foresight analysis in this study was guided by a structured framework that encompasses stages of framing, environmental scanning, futuring trend analysis, scenario development for visioning, backcasting, and strategy formulation to implement [5]. The selected framework ensures a comprehensive exploration of how stakeholders are leveraging strategic foresight to align with the blue economy sectors.

2.2.2 Scanning Data Collection

Secondary data for the Strategic Foresight Analysis phase were collected through desk study.

2.2.3 Scenario Development for Visioning

Building on the collected data, authors proposed the scenarios that were developed to explore potential future trajectories for the development of the blue economy sectors. These scenarios

were informed by emerging trends, technological advancements, and societal shifts identified through the secondary data.

2.2.4 Backcasting and Strategy Implementation

The strategic implementations derived from the developed scenarios were synthesized to formulate strategies for the blue economy sectors. These strategies consider both short-term and long-term perspectives, emphasizing adaptive approaches to an uncertain future.

3 Result and Discussion

3.1 Descriptive Analysis

From the SLR data, it is evident that the scholarly interest in the Blue Economy concerning Indonesia has been on an upward trajectory since 2016 (Figure 2). In that year, the Scopus database recorded a modest count of only two articles on the subject. This increasing trend underscores the growing academic attention and significance of the Blue Economy within the Indonesian context. Notably, the year 2023 marks a significant milestone in this research domain, witnessing the highest number of publications since 2016, with a total of seven articles. This surge suggests a increasing interest and potentially indicates the maturing of research in this area, emphasizing the relevance and appropriateness of the Blue Economy in Indonesia's contemporary discourse.

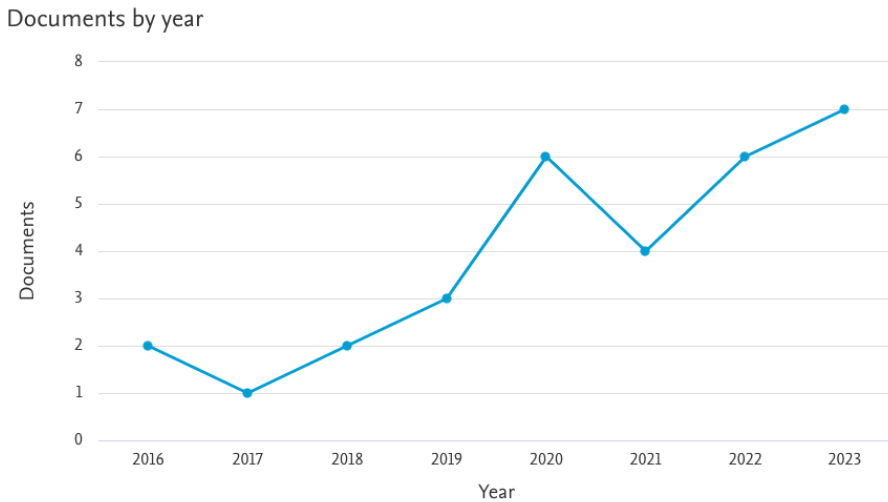


Fig. 2. Growth in Publications on Blue Economy in Indonesia

Upon examining SLR, it is discernible that the predominant subject field delving into the Blue Economy within Indonesia is Environmental Sciences, accounting for a significant 24.4% of the total research output (Table 1). This dominance can be attributed to several reasons. Primarily, the Blue Economy inherently aligns with sustainable environmental practices, focusing on the balanced use of marine resources, protection of aquatic ecosystems, and promotion of green maritime technologies. Consequently, the Environmental Sciences domain is naturally positioned to undertake in-depth research into the ecological facets of the

Blue Economy. Following Environmental Sciences, Social Science contributes 14.1% to the body of research. This is likely because the Blue Economy not only impacts environmental sustainability but also influences socio-economic dynamics, including livelihoods, coastal community resilience, and regional economic growth. Earth and Planetary Sciences, at 12.8%, further highlight the multi-disciplinary nature of Blue Economy studies, shedding light on geological, oceanographic, and atmospheric perspectives that play pivotal roles in comprehending and optimizing the sustainable utilization of marine assets in Indonesia.

Table 1. Subject Area of Publication

Subject Area	Percentage	Subject Area	Percentage
Environmental Sciences	24.4%	Agricultural and Biological Sciences	5.1%
Social Sciences	14.1%	Business, Management and Accounting	2.6%
Earth and Planetary Sciences	12.8%	Economics, Econometrics and Finance	2.6%
Engineering	12.8%	Mathematics	2.6%
Computer Science	9.0%	Other	6.4%
Energy	7.7%		

Referring to SLR data, it becomes evident that the research pertaining to the Blue Economy in Indonesia extends beyond its geographical boundaries (Figure 3). An interesting observation from the data is that a total of 15 countries, as indexed in the Scopus database, have undertaken academic inquiries into the Blue Economy in relation to Indonesia. While it might be anticipated that Indonesia leads in the volume of publications with 25 articles, given its direct relevance and the nation's intrinsic interest in its own marine economic landscape, it is important to recognize the global attention this topic garners. New Zealand and the United Kingdom are notable contributors in this domain, each with two articles. The international resonance of this topic is further corroborated by contributions from a diverse array of countries such as Australia, French Polynesia, Ireland, Italy, New Caledonia, Portugal, and the United States. This widespread academic interest underscores the global significance of Indonesia's Blue Economy and perhaps its role as a model or case study for sustainable marine economic endeavours in diverse global contexts.

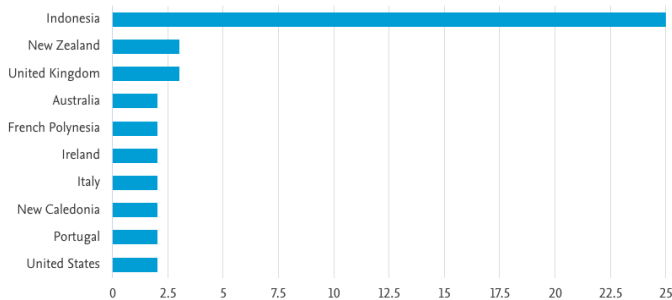


Fig. 3. Publications by Countries

3.2 Bibliometric Analysis

To identify thematic resemblances within the existing literature, two bibliometric methods are employed in this study: (1) keyword co-occurrence and (2) co-authorship analysis. It is crucial to note that every article within our dataset was subjected to analysis, irrespective of its citation count. This approach was adopted to ensure inclusivity, as omitting non-cited articles could accidentally result in the exclusion of potentially foundational or emerging research pieces, thereby compromising the depth and comprehensiveness of our analysis.

3.2.1 Keywords Analysis

The captivating findings also encompass the clustering and connectedness of keywords. The Figure 4 presented elucidates the network visualization of keyword analysis derived from the VOSviewer results. It systematically showcases the recurring themes and prominent terms, providing insights into the predominant concentrations and research trends within the dataset. This keyword tabulation offers a concise overview of the primary subjects and areas of emphasis, serving as a guiding compass for understanding the broader context and nuances of the VOSviewer analysis outcomes. Upon analyzing the keywords, we discovered three distinct clusters with a total of 17 terms (Table 2).

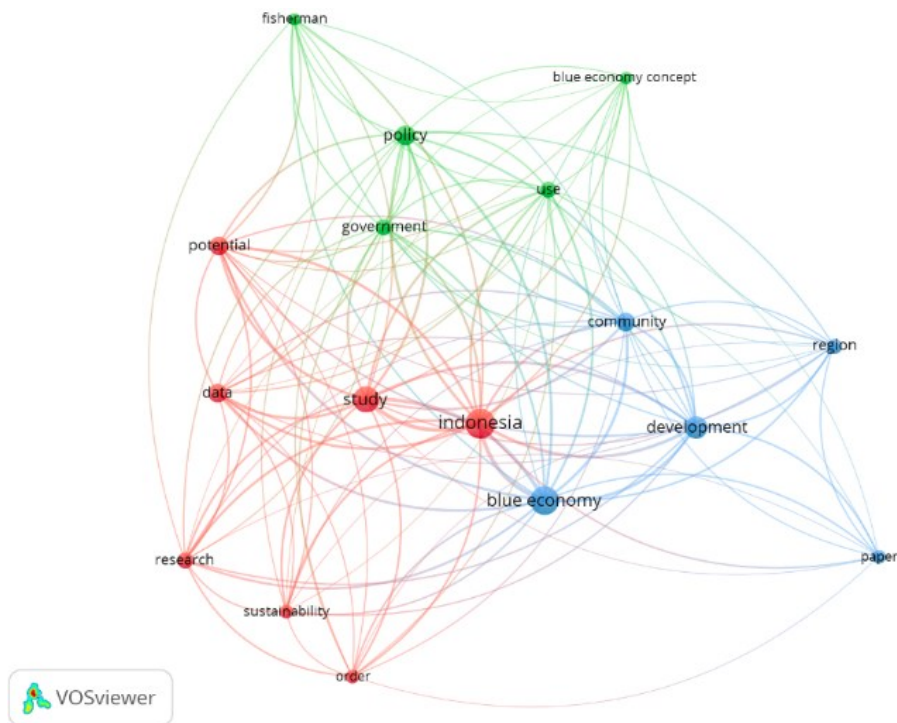


Fig. 4. Network Visualization of Keyword Analysis

Table 2. Cluster of Keyword Analysis

Cluster 1 (N = 7)	Cluster 2 (N = 5)	Cluster 3 (N = 5)
Data	Blue Economy Concept	Blue Economy
Indonesia	Fisherman	Community
Order	Government	Development
Potential	Policy	Paper
Research	Use	Region
Study		
Sustainability		



Fig. 5. Density Visualization of Keyword Analysis

The utilization of VOSviewer visualization in bibliometric analysis showcases the trend of research topics in scientific publications related to the blue economy in Indonesia. Density visualization is a key tool used to represent item density on a map. By employing colour from blue to green to yellow to represent item density [6], density visualization can provide insights into the distribution of research topics. The density visualization in Figure 5 shows that the prominent research topics are Indonesia, blue economy, study, and development represented by high density item weights displayed in yellow. This suggests that the research topics of Indonesia, blue economy, study, and development are extensively discussed and published. By analysing the distribution of these topics, we can gain a deeper understanding

of the research trends in recent scientific publications related to the blue economy in Indonesia.

In summary, the presented table and density visualization provide valuable insights into the research topics and trends in scientific publications related to the blue economy in Indonesia. By providing a comprehensive overview of the primary subjects and areas of emphasis, we can better understand the broader context and nuances of the VOSviewer analysis outcomes.

3.2.2 Co-Authorship Analysis

The process of creating a piece of work often involves collaboration among authors. To better understand the network of author collaborations within academic journals that focus on the blue economy in Indonesia, we visualized the collaborations on a network map. In order to ensure a thorough analysis, we examined every article, even those that have not been cited. This approach avoids the exclusion of potentially important articles. The network map is divided into clusters, each containing at least one article. These clusters represent a collaboration network by the authors and are distinguished by colour variations as shown in Figure 6. The 30 authors met our threshold for inclusion in the analysis. These authors were then distributed across 30 clusters. The outcomes of the co-authorship analysis indicate that there are still gaps in the research field in Indonesia, as there were initially a small number of papers. This suggests that there is still much to discover and explore in this area.



Fig. 6. Network Visualization of Co-Authorship Analysis

Additionally, the outcomes of the co-authorship visualization highlight the most productive contributors to publications in recent years. These authors have engaged in numerous collaborations to produce high-quality articles. As evidenced by Table 3, Nugraha, Luthfiani, and Desnanjaya have worked together on three separate articles. This level of collaboration indicates a strong commitment to producing excellent research in their field. Similarly, Booth, Milner-Gulland, and Mourato have collaborated on two articles, further solidifying their place as a key part of a thriving network of authors who are dedicated to pushing the boundaries of their field through their research. It is clear that these authors place a high value on collaboration and have reaped the benefits of their teamwork through their outstanding publications.

Table 3. Authors with Most Co-Authorship Publications

Authors	Number of Articles	Title of Articles
Booth,H. Milner-Gulland, E.J. Mourato, S.	2	<ol style="list-style-type: none"> 1. Investigating Acceptance of Marine Tourism Levies, to Cover the Opportunity Costs of Conservation for Coastal Communities. Published in 2022 at Ecological Economics. 2. Designing Locally-Appropriate Conservation Incentives for Small-Scale Fishers. Published in 2023 at Biological Conservation.
Nugraha, I.M.A Desnanjaya, I.G.M.N Luthfiani, F.	3	<ol style="list-style-type: none"> 1. Fish Drying Machine with PV System for Fishermen to Support Blue Economy. Published in 2023 at Bulletin of Electrical Engineering and Informatics. 2. Potential of Using Photovoltaic Systems to Power Underwater Fishing Lights in Small-Scale Fishing Vessels in Indonesia. Published in 2023 at International Journal of Electrical & Computer Engineering. 3. Technical-Economical Assessment of Solar PV Systems On Small-Scale Fishing Vessels. Published in 2022 at International Journal of Power Electronics and Drive Systems.

4 Strategic Foresight

4.1 Step 1. Framing

4.1.1 Domain Description

Exteriorize Indonesia as a Global Blue Economy Pioneer through competitive, innovative, sustainable and inclusive optimization of Coastal marine utilization in 2030.

4.1.2 Assessment

4.1.3 Logistic

- Project timeline: 2023 - 2030
- Executor: Bappenas, Ministry of Maritime Affairs and Fisheries, Universities, Companies in the Maritime & Fisheries Sector, Investors, Coastal communities

4.2 Step 2. Scanning

4.2.1 Economic

The World Bank estimated Indonesia's ocean economy to have an annual worth of more than USD 280 billion, as the largest archipelagic nation in the world with abundant wealth of natural marine resources. Despite the great estimated value, the blue economy sector in

Indonesia in the last five years only contributed around 2.6% to Gross Domestic Product (GDP), mainly owing to the fisheries sector. With greater capability, the blue economy development in Indonesia is essential for economic transformation to escape the middle-income trap.

Table 4. Blue Economy Assessment Strategic Foresight

Blue Economy Assessment	
Percentage of Marine Protected Area	Investment in blue economy sectors
Ocean resource quality	Export of blue economy products and services
Ocean renewable energy ratio	Employment in blue economy sectors
Maritime GDP contribution to economy	Maritime research and innovation index

4.2.2 Political

More than 66% of Southeast Asia's total area is covered by ocean and sea, but only Singapore and Brunei Darussalam are classified as high-income countries in ASEAN. Therefore, through emphasizing the blue economy in ASEAN, it is hoped to be the new engine of growth that can improve the people's welfare. The ASEAN Leaders Declaration in 2021 reemphasized the blue economy and the need for sustainable, resilient, inclusive use and management and conservation of the ocean, sea and marine life.

4.2.3 Ethical Issue

Approximately 96% of fishing boats in Indonesia fall within the category of under ten gross tons. However, a mere 20% of the country's total fish catches are attributed to small-scale fishers, as reported by The Conversation in 2021. Households dependent on fishing in Indonesia continue to cope with poverty due to inadequate recognition and support. The difficulty of small-scale fishers is worsened by the competition they face from large corporations and investments, resulting in a struggle for their survival space.

4.2.4 Legal

The Legal Aspect of the Blue Economy actually becomes one of the mature contexts inside the whole Blue Economy Ecosystem in Indonesia. all of the Activities inside the Blue Economy already based on several Government Policy regarding what and how to conduct to maximize the Blue Economy Industries. The Regulation itself is already being written in the Ministerial Regulation of the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia. While also being strengthened by the implementation of regulation regarding the Indonesian National Standard to arrange everything regarding the Blue Economy.

4.2.5 Socio-Cultural

OECD's Sustainable Ocean Economy stated that 95% of Indonesia's population lives within 100 km of the coastline, and 40 million rural Indonesians depend on biodiversity for subsistence [7]. The population in the coastal area mostly are traditional communities whose lives have long revolved around the sea. With the issue of the blue economy where the practices may no longer be traditional and using more advanced tools instead, the adaptability of the coastal communities should be a main concern for the government to apply the blue economy in Indonesia.

4.2.6 Technological

Technological Development on the Maritime Industry in Indonesia nowadays is already reaching the most advanced technological development for the past decades. This actually can be seen from several Technological Implementation in the maritime industry namely robotics, artificial intelligence, big data, and internet of things. All of this is related with electronic components such as processors, data storage, RAM, microcontrollers, and various sensors which make life easier regarding the maximization of Blue Economy Growth.

4.2.7 Environmental

About 38 percent of the nation's marine capture fisheries are overfished, around one-third of Indonesia's valuable coral reefs are in poor condition, and important coastal ecosystems such as mangroves show substantial losses. Some popular marine and coastal tourism destinations are also showing the effects of overcrowding and inadequate basic infrastructure.

4.3 Step 3. Futuring

4.3.1 Disaster Scenario

Stakeholders in Indonesia fail to apply the blue economy in a sustainable manner, causing progressive damage to the oceans in Indonesia. Damage to the oceans can cause a lack of supply of seafood protein and result in nutritional instability for the Indonesian people. With the loss of biodiversity in the oceans, coastal communities will also lose their livelihoods and decrease GDP contribution from fisheries and maritime sectors. The absence of an element of sustainability also will make the sea an only place for industrial exploitation which will exacerbate climate change globally.

4.3.2 Surprise-free Scenario

The Indonesian Stakeholders are able to develop a supportive ecosystem in which meeting the needs of the Industries of the Blue Economy while also able to start an Advanced Technological implementation in several Main Maritime Facilities that boost the capabilities of the society while also introduced all stakeholders to conduct an end-to-end Business Process in Blue Economy.

4.3.3 Transformational Scenario

The Indonesian Stakeholders able to develop a Growing supportive ecosystem in which meeting the needs of the Industries of Blue Economy while also able to start a Equal

Distribution of Advanced Technological implementation in all of the Maritime Facilities that boost the capabilities of the society while also introduced all stakeholders to conduct an end to end Business Process in Blue Economy and become a Global Leader on Business Practice in the Blue Economy

4.4 Step 4. Visioning

4.4.1 Main Vision

Externalise Indonesia as a Global Blue Economy Pioneer through competitive, innovative, sustainable and inclusive optimization of Coastal marine utilization in 2030:

- 1 Indonesia become the global leader for Blue Economy development.
- 2 All stakeholders of Blue Economy in Indonesia having an excellent competency regarding the Blue Economy as part of their human capital development.
- 3 Indonesia succeeds on boosting the Blue Economy Ecosystem Development Nationwide
- 4 Indonesian have the sustainable capabilities on developing Maritime Business
- 5 Indonesian has independence and toughness in implementing the business system both in terms of finance, facilities, and knowledge.

4.5 Step 5. Backcasting

Table 5 shows the backcasting of the Indonesian Blue Economy.

Table 5. Blue Economy Backcasting Strategic Foresight

2025	2027	2030
In 2025 The goals is to develop the Human Capital Quality through a continuous advance program to make sure all of the coastal maritime communities are more than capable to optimize the sustainable Blue Economy	In 2027 Indonesian Government with all the stakeholders of the Blue Economy Ecosystem should push the technological distribution in all of the Coastal and Maritime communities to enhance Indonesia as the global leading Blue Economy Countries	In 2030 Indonesia will achieve the predicate as The Global Leading Blue Economy with the significant Improvement of the GDP contribution from the Blue Economy and also to utilize the most advance system and technology in the Coastal Maritime Industries

4.6 Step 6. Implementing

The implementation strategy for the advancement and enhancement of the capabilities of Indonesian coastal communities can be implemented through a proactive approach towards the human capital as the first milestone from the backcasting steps. Internal strategies are needed to be developed by optimizing the quality of the community's human resources, increasing the communities' knowledge, abilities and skills [8]. The early stage to act on this initiative can be started by conducting socialization to communities in the blue economy priority areas, which were previously reviewed in terms of the readiness and the potential of their marine resources. In addition to the relevant ministries, green NGOs as well as national voluntary teaching programs organized by the government and the private sector, need to be involved to accelerate human capital readiness of the blue economy on the coastal

communities. The internal strategies must be equipped by government's supports by supporting the infrastructures, increasing the coastal communities' financial and capital through loan facilities, and providing regulations to protect coastal communities' small businesses from large corporations.

5 Conclusion

The pressing need to explore and optimize the Blue Economy in Indonesia cannot be understated, given its rich maritime biodiversity and the immense economic promise it harbour's. In our systematic literature review, drawing primarily from the Scopus database, we meticulously analysed the prevailing research landscape on this topic. The prevailing body of literature showcases a commendable focus on sustainable fisheries, avenues for tourism enhancement, and the adoption of effective technological innovations aimed at empowering fishermen. These are undoubtedly invaluable insights, offering pragmatic solutions that address specific facets of the Blue Economy.

However, a intense gap was evident in the existing research: there was a noticeable absence of literature offering a holistic and strategic perspective on the improvement of the Blue Economy in Indonesia. Rather than reaching into niche realms, there is a pressing need to have an overarching, strategic, and visionary blueprint for the entirety of the Blue Economy in the nation. Critical to this is the analysis of human capital competencies. Human Capital Management (HCM) serves as the bedrock of any endeavour; without a skilled, knowledgeable, and empowered workforce, even the most potent of strategies can fade. As we embark on the journey to enhance the Blue Economy, the investment in our human capital emerges as the obvious starting point.

Recognizing these gaps and needs, our research employed strategic foresight, a methodological approach encompassing six stages: framing, scanning, futuring, visioning, backcasting, and implementing. This methodology not only offers a structured roadmap but also envisions a future-ready Blue Economy for Indonesia. Charting a course until 2030, this strategic foresight provides stakeholders with a project timeline that is both actionable and aspirational, effectively bridging the current state with the envisioned future.

In essence, while the existing research has laid down essential building blocks, our study underscores the need for a more expansive, integrated, and strategic approach. Indonesia's Blue Economy has the potential to be a ideal for sustainable maritime economic growth. Yet, it necessitates a blend of human capital investment, strategic planning, and a panoramic vision that looks beyond immediate challenges to a horizon rich with opportunity.

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