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Human Resource Competency Development to Support the Development of Blue Economy-Based Marine Energy

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ABSTRACT: The utilization of ocean energy based on the blue economy has become a primary focus in efforts to achieve sustainability in the maritime sector. The development of this sector requires high-quality human resources to address complex challenges. Therefore, this research aims to identify the need for human resource competencies to support the development of ocean energy based on the blue economy. This study adopts a mixed-methods approach (qualitative and quantitative) with a survey of stakeholders in the ocean energy sector. The survey will be conducted to gather data on the competencies required by personnel in various fields such as technology services, management, and law. The collected data will be analyzed using factor analysis techniques to identify the most important competencies. The targeted outcome is to provide employees as future generations with additional knowledge insight into relevant blue economy aspects aligning with the needs and challenges they will face in the future. We hope that the results of this research will provide valuable information for those involved in human resource development in the ocean energy service sector. This information can be utilized to develop training and staff development programs tailored to the specific needs.

Keywords: Ocean Energy, Blue Economy, Human Resource Competencies

INTRODUCTION

Oceans and marine resources play a central role in sustainable development efforts around the world (Severi & Ling, 2013) This needs a deep understanding because marine energy development still faces various challenges, such as high costs, immature technology, incomplete regulations, and unknown environmental impacts. Therefore, joint efforts from various parties, including government, industry, academia, and society, are needed to encourage the development of marine energy based on the blue economy.

The approach through "Blue Economy" has broad relevance as the utilization of marine products for the prosperity of the Community (Perkasa et al., 2024a). Blue economy is a concept that refers to the sustainable use of marine resources for economic growth and livelihood improvement (Prasutiyon, 2018) The blue economy emphasizes the importance of maintaining a balance between sustainability and economic growth, as well as utilizing the potential and value of marine resources optimally (Nurhayati, 2015) Several countries and regions have adopted the blue economy concept as a national development strategy, such as the European Union, China, and Indonesia. Blue Economy is interpreted as an idea or policy model oriented towards balancing the use and preservation of marine resources (Polanunu & Kusumaningrum, 2022)

Responding to this, bright ideas are needed to manage and utilize all resources in the Indonesian sea so that in the future development is right on target and certainly sustainable (Banu, 2020a). Sustainable competitive advantage is the direction of the company's strategy which is not the ultimate goal, but is a tool to achieve the Company's goals (Krisnanto, 2017). One of the key factors that determine the success of blue economy-based marine energy development is the availability and quality of human resources (HR). Quality human resources are human resources who have competencies that are in accordance with the needs and challenges in the marine energy sector. Competence is the ability to perform a specific task well, which includes knowledge, skills, attitudes, and behaviors. The competencies required in the marine energy sector can be technical, managerial, or legal, depending on the field and role held. HR competencies, which include knowledge, skills, attitudes, and behaviors, are key elements in facing global challenges (Perkasa, 2016)

The research problem focuses on competence in the development of the blue economy. However, there is currently no comprehensive study on the need for human resource competence in the blue economy-based marine energy sector in Indonesia (Sujiwo & Nurlaili, 2024). In fact, this information is essential for planning and implementing effective and relevant staff training and development programs. Therefore, this study aims to fill the gap by identifying the need for human resource competencies to support the development of blue economy-based marine energy in Indonesia. Some of the problems involved improving and developing human resource competencies and institutional strengthening.

Although the blue economy has the potential to play a role in sustainable marine development, until now the practices to implement the blue economy concept are still relatively limited (Sujiwo & Nurlaili, 2024).

Marine Energy is a potentially large alternative energy source and includes wave, tidal, offshore wind, salinity gradient, and thermal ocean energy (Borthwick, 2016). Marine energy development involves collaboration between various parties, including scientists, engineers, policy experts, and industry stakeholders (Zhang, 2012). The Blue Economy concept optimizes aquatic resources for sustainable economic growth by considering environmental sustainability.

In the pursuit of sustainable development within the maritime industry, human resource development is pivotal, especially in the context of Blue Economy-based marine energy sectors.

The Blue Economy is critical as it leverages the sustainable use of ocean resources to support economic growth, enhance livelihoods, and promote the conservation of marine ecosystems. (Papathanasiou et al., 2018) emphasize the importance of ocean literacy in workforce development, specifically in the marine and shipbuilding sectors, to address skill shortages and enhance sector resilience (Papathanasiou et al., 2018b). Similarly, (Agarwala, 2022) discusses the integration of ocean-based renewable energy technologies within India's Blue Economy to power sustainable economic activities (Agarwala, 2022b). Furthermore, (Quero García et al., 2020) explore the role of marine spatial planning in Southern Europe, highlighting its potential to incorporate blue energy policies effectively within the Blue Economy framework (Quero García et al., 2020).

The need for specialized skills and knowledge in marine energy and its related technologies necessitates targeted human resource strategies. (Fontes et al., 2020) analyze the impact of research and innovation partnerships on the development of ocean-related industries in Portugal, indicating a shift towards sustainable marine resource exploitation (Fontes et al., 2020b). (Choudhary et al., 2021) argue for the empowerment of the Blue Economy through sustainable industry practices, emphasizing the importance of integrating new business models that prioritize environmental conservation and resource management (Choudhary et al., 2021b). Moreover, (van den Burg et al., 2019) focus on the geographical potential for co-use of marine space, stressing the importance of innovative industry combinations to foster growth in marine sectors ((van den Burg et al., 2019).

Finally, fostering collaboration among different stakeholders is essential to the successful integration of marine energy resources within the Blue Economy. (Bennett et al., 2019) discuss the need for environmentally sustainable and socially equitable Blue Economy practices, urging a shift towards policies that prioritize both ecological protection and economic benefit (Bennett et al., 2019b). (Tegar & Gurning, 2018) highlight the development of marine and coastal tourism based on the Blue Economy, suggesting that economic growth should be aligned with environmental conservation and social sustainability (Tegar & Gurning, 2018b). (Lange et al., 2018) address governance challenges in U.S. marine renewable energy developments, emphasizing the creation of enabling conditions for successful project implementation (Lange et al., 2018b).

The Minister of Maritime Affairs and Fisheries, Sakti Wahyu Trenggono, stated that the application of Blue Economy principles by balancing ecological sustainability and improving people's welfare is one of the nation's future hopes for strengthening the national economy. (M Razi Rahman, 2021). One of the entrepreneurs who support the blue economy is Shinta Widjaja Kamdani, CEO of Sintesa Group. Shinta Widjaja Kamdani fully supports the implementation of the blue economy concept in sustainable development in Indonesia, emphasizing the importance of collaboration between the government, private sector, and society in realizing the blue economy (Joko Sugiarsono, 2021)

Currently, it shows that the competence of marine human resources is still weak, because the policy system implemented so far has missed the development orientation which is more towards land-based socio-economic development than marine socio-economic development (Setiawan & Sudja, 2021a). Focus research on employees who work ecotourism who work in Bandar Jakarta Ancol

restaurant. This research is to find out how the competence of marine resources to support the development of marine energy based on blue economy.

METHOD

The type of research we use is a mixed type of research combining qualitative and quantitative approaches in one study. The aim is to provide a more comprehensive understanding of the phenomenon under study. With this approach, researchers can answer the questions of "why" (qualitative) and "how much" (quantitative) simultaneously. Mixed research methods can be carried out in two ways: convergent (data analyzed integrated) or parallel (data analyzed separately). Benefits include deep understanding, validation of findings, and overcoming method limitations. Examples of mixed research involve interviews (qualitative) with respondents and measurements (quantitative) related to certain variables.

The approach we use is the Mixed Methods Approach, Mixed research methods, or mixed methods, is a research approach that combines quantitative and qualitative methods in one study. This is done to overcome the weaknesses of each method and to collect more comprehensive and valid data. Mixed research aims to explore and validate the results of quantitative research with qualitative research, as well as to provide more comprehensive and accurate conclusions.

The subject of research is the source of information according to (Moleong, 2015) is the person who best understands what is being researched or the person used to provide information about the situation and conditions of the research background. Therefore, to determine the subject of this study, there are several things that need to be considered, namely people who follow the activities being researched and have sufficient time to be asked for information. To obtain information is carried out in accordance with Patton's opinion (Patton, 2001), that choosing informants must be considered to know best, so that the selection is balanced according to the needs and stability of researchers (Murdiyanto, 2020a). The subjects in this study were employees working at Bandar Djakarta Ancol Restaurant, West Jakarta.The data needed in this study used questionnaires given to employees working at Bandar Djakarta Ancol Restaurant. West Jakarta.

According to (Sugiyono, 2010), questionnaire is an information collection technique that involves submitting various questions or written statements to respondents to be answered. This study used a type of data consisting of primary data collected directly and pre-existing secondary data. The original data points to facts obtained directly from the source being studied. Secondary data are sources of information that are not directly obtained by researchers, but through other sources such as individuals or documents. This data can be obtained from various sources, such as scientific publications, books, previous studies, the internet, and other sources relevant to the research topic. The purpose is to obtain relevant information that can be used in the preparation of research

The study was conducted on employees working at Bandar Djakarta Ancol Restaurant. West Jakarta. While the time the study was conducted in January until now is still ongoing.

The data collection technique we use is to create and distribute surveys or questionnaires online using Google Forms. Google Forms has various features that can help users collect data, such as:

Choose the type of questions that suit the purpose of the study, such as multiple choice, scale, checkbox, paragraph, etc.

1. Add validation, logic, and explanations to each question to ensure the quality and relevance of the data obtained
2. Choose the type of questions that suit the purpose of the study, such as multiple choice, scale, checkbox, paragraph, etc.
3. Set the appearance and design of the form according to user preferences, such as colors, images, videos, etc
4. Integrate forms with Google Sheets to automatically store and analyze data
5. Share forms through a variety of media, such as email and links
6. View and download survey results reports in the form of graphs, tables, or files

By using Google Forms, we can collect data easily, quickly, and efficiently. Google Forms can also increase participation and 19% responses from respondents, as forms can be filled out anytime and anywhere via any internet-connected device.

This study used descriptive analysis techniques. That is the research method by collecting data in accordance with the truth then the data is compiled, processed and analyzed to be able to provide an overview of the existing problem. In descriptive analysis, data is usually displayed in the form of ordinary tables or frequency tables, graphs, bar charts, line charts, pie charts, data centering measures, data distribution measures and so on (Sugiyono, 2010) Descriptive analysis aims to transform a set of data that is still raw data into a more understandable form, which is in the form of more concise information. For example, using a bar chart.

This research uses qualitative descriptive method, which is a systematic way through the procedure used to produce a theory that explains the outline of a topic substance and what theory emerges. The analysis used by thematic analysis is qualitative research because it does not aim to generalize the results of the research, so what is studied is specific or specific things, and the analysis is thematic (Murdiyanto, 2020b).

RESULT AND DISCUSSION

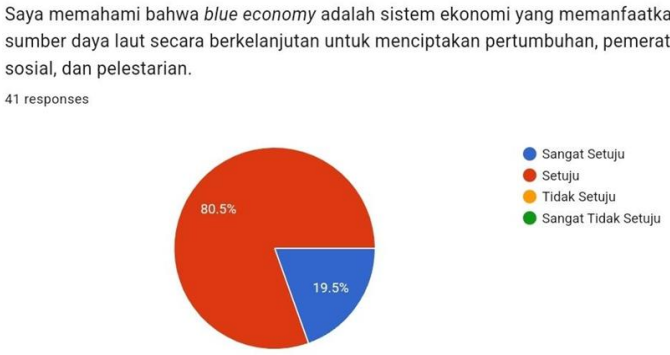
For this study, the authors filled out a questionnaire from the Google Form link distributed to employees who worked at Bandar Djakarta Ancol Restaurant, West Jakarta. This data was collected by the author from January 29, 2024. The following are the characters of respondents who have participated in the study as listed in table 1 below:

Table 1. Characteristics of Respondents

Characteristic Respondents	Category	Sum	Presentase (%)
Gender	Man	23	56.1%
	Woman	18	43.9%
Age	20 - 26 Years (Generasi Z)	38	92.6%
	27 - 42 Years (Millennial Generation)	2	4.8%
	43 - 58 Years (Generasi Y)	1	2,4%
Education	SMA/MA	13	31,7%
	SMK	9	22%
	S1	19	46.3%
	S2/S3	-	-
Work	Ya	13	41.5%
	Not yet	28	58.5%

Respondents in this study consisted of 56.1% men and 43.9% women. The majority of respondents (92.6%) are aged between 20-26 years, including in Generation Z. As many as 46.3% of respondents have a Bachelor degree (S1), 31.7% have a high school / MA education, and 22% from vocational schools. A total of 58.5% of respondents were not employed and 41.5% worked in various fields, such as administration, logistics, finance, coffee, marketing, business owners, customer service, staff, trade, and reception. There were 7.6% of respondents who were students.

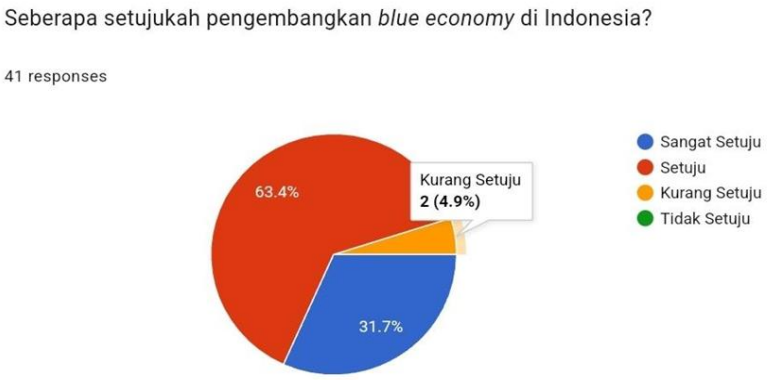
Figure 1. ***Blue Economy Understanding Indicator Diagram***



Source : Calculation result from questionnaire

The red section of the pie chart shows the percentage of people who agree with the statement (80.5%). While the blue section shows the percentage of people who disagree (19.5%). This shows that the majority of people who handled the survey believe that the blue economy is important. The blue economy is a concept that is increasingly in demand around the world as a way to foster economic development while protecting the marine environment.

Figure 2. ***Blue Economy Development Indicator Diagram***



Source : Calculation result from questionnaire

The red section of the pie chart shows the percentage of people who agree with the statement (63.4%). While the yellow section shows the percentage of people who disagree (4.9%) and the blue section shows the percentage of people who strongly agree (31.7%). These results show that the blue economy has great potential to be developed in Indonesia. Indonesians have a good understanding of the blue economy and support its development. This is an important capital to realize sustainable economic development in Indonesia.

Figure 3. ***Blue Economy Utilization Indicator Diagram***

Source : Calculation result from questionnaire

The red section of the pie chart shows the percentage of people who agree with the statement (68.3%). While the yellow section shows the percentage of people who disagree (4.9%) and the blue section shows the percentage of people who strongly agree (26.8%). These results show that the blue economy has great potential to be developed in Indonesia. Indonesians have a good understanding of the blue economy and its benefits, particularly in terms of economic

improvement, employment, and energy security. This is an important capital to realize sustainable economic development in Indonesia.

Figure 4. Indicator Diagram of Attending Blue Economy Seminar or Training

Source : Calculation result from questionnaire

The red part of the pie chart shows the percentage of people who did not attend seminars and trainings (51.2%). While the blue section shows the percentage of people who attended seminars and trainings (48.8%). These results show that the blue economy has great potential to open up new job opportunities in Indonesia. Public optimism towards the blue economy can be an important capital to encourage the development of this sector.

Figure 5. Indicator Diagram of How Often to Attend *Blue Economy Training or Seminar*

Source : Calculation result from questionnaire

The green part of the pie chart shows the percentage of how often you attend seminars and trainings once a year (29.2%). While the blue section shows the percentage of people who attend seminars and trainings every 0 months (4.2%) and the yellow section shows the percentage of people who attend seminars and trainings every six months (20.8%). In addition, the red section shows the percentage of people who attend seminars and trainings every three months (37.5%)

and the purple section shows the percentage of people who have never attended seminars and trainings every month (8.3%). These results show that the blue economy has great potential to have a positive impact on the economy of people in Indonesia. Public optimism towards the blue economy can be an important capital to encourage the development of this sector.

Figure 6. Diagram of Indicators for Improving the Competency of Marine Energy Human Resources Based on *Blue Economy*

Source : Calculation result from questionnaire

The red section of the pie chart shows the percentage of people who think improving HR skills is important (68.3%). While the blue section shows the percentage of people who think that improving HR skills is very important (31.7%). The majority of respondents (68.3%) consider that improving human resource skills is very important to support the development of marine energy human resource competencies based on the blue economy. This shows that respondents realize the importance of skilled human resources in utilizing marine resources sustainably.

Figure 7. Diagram of Skill Indicators required for Human Resources Competency of Marine Energy Based on *Blue economy*

Source : Calculation result from questionnaire

Based on the survey results, it can be concluded that the most needed skills for the development of marine energy human resources based on the blue economy are management skills. This shows that human resources are needed who are able to lead and manage marine energy projects effectively. Other skills that are also important are technical skills, data analysis, communication, and leadership. Technical skills are needed to build and maintain marine energy infrastructure. Data analysis skills are needed to analyze data and make informed decisions. Communication skills are needed to establish cooperation with various parties. And leadership skills are needed to lead teams and achieve goals.

Figure 8. Blue Economy Seminar or Effectiveness Indicator Diagram

Source : Calculation result from questionnaire

Based on the survey results, it can be concluded that the majority of respondents (73.2%) agree and strongly agree (24.4%) that training or seminars are effective in improving human resource (HR) skills in supporting the development of marine human resources competencies based on the blue economy. This shows that training and seminars can be an effective tool to improve the knowledge, abilities, and skills of Marine Human Resources. However, there was 1 respondent (2.4%) who did not agree with the effectiveness of training or seminars. This shows that training and seminars are not always effective for everyone.

Figure 9. Diagram of Impact Indicators of Improving the Competence of Marine Energy Human Resources Based on *the Blue Economy*

Source : Calculation result from questionnaire

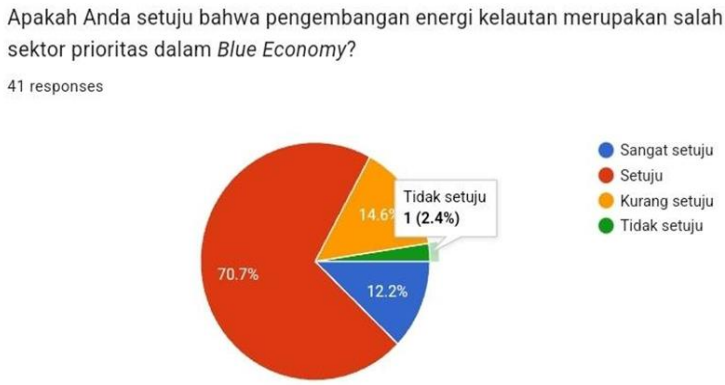
Based on the survey results, it can be concluded that increasing the competence of human resources has various positive impacts on the development of blue economy-based marine energy. The most significant impacts were increasing efficiency and productivity (36.6%), improving the quality of products and services (29.3%) and increasing competitiveness (22%). Therefore, it is important for the government and companies to invest in the development of human resource competencies in order to develop blue economy-based marine energy in a sustainable manner.

Figure 10. Diagram of Marine Energy Utilization Indicators for Blue *Economy*

Source : Calculation result from questionnaire

Based on the survey results, 61% of respondents stated that all listed benefits (increasing economic growth and community welfare, maintaining maritime sovereignty and security, conserving marine resources and ecosystems) are important benefits of the blue economy for Indonesia. This shows that the blue economy has great potential to provide various benefits for the country and the people of Indonesia.

Figure 11. Diagram of Priority Indicators for Marine Energy Development Blue *Economy*



Source : Calculation result from questionnaire

Based on the survey results, it can be concluded that the majority of respondents (70.7%) and (12.2%) agree that the development of marine energy is one of the priority sectors in the blue economy. However, there were 14.6% of respondents who disagreed and 2.4% of respondents who disagreed with the development of marine energy. This shows that there is still a small part of the community that does not have enough awareness about the importance of marine energy development.

Figure 12. Blue Economy Challenge or Obstacle Indicator Diagram

Source : Calculation result from questionnaire

Based on the survey results, 58.5% of respondents stated that all the challenges or obstacles listed (lack of knowledge and technology, lack of policy and regulatory support, lack of community involvement and participation, lack of capital availability and accessibility) are challenges or obstacles in the development of marine energy in Indonesia. This shows that there are various

challenges or obstacles that need to be overcome to achieve marine energy development in Indonesia.

According to (Tahar et al., 2022) Some points that need to be considered in efforts to develop human resources towards superior competencies in the digital era are:

1. *Digital Skill for Digital Competency*
   Digital competence is the knowledge, skills, attitudes and awareness needed when using information technology. So that Management must seriously improve employee skills training in achieving digital competence.
2. Penerapan *Digital Competency Development*
   Digital skills and good digital application are an institution's success in the application of digital technology.
3. Increased *Human Value*
   Human resource development which includes the development of self-identity, namely fostering a sense of empathy and sympathy, being able to interact / communicate with any social group so that it can survive in all dynamics.

To succeed in achieving society 5.0, there are three levels of individual competence that must be developed, namely:

1. Interpersonal Competence
   Interpersonal competencies include communication, (virtual) collaboration, social intelligence and intercultural competence.
2. Intrapersonal Competence
   Intrapersonal competencies include critical thinking, making sense, adaptive thinking and integration, transdisciplinary and self-direction.
3. Improve ICT skills

ICT skills include expertise in information and communication technology, computational thinking, social media literacy and information security awareness.

Table 2. Implementation of Blue Economy from previous research

Researchers	Implementation
(Adnan & Hasana, 2023)	The concept of blue economy, which emphasizes the sustainable use of marine and marine resources, has become an important paradigm in global economic development.
(Prayuda & Sary, 2019)	Basically, Indonesia has challenges in solving the economic problems of people living in coastal areas
(Perkasa et al., 2024b)	The blue economy concept is an approach model that no longer relies on development by exploiting natural resources

(Polanunu & Kusumaningrum, 2022b)	The Indonesian government's strategy is to prioritize sustainable marine development in the national marine policy and is also committed to contributing to the world's sustainable marine development with blue economy principles
(Sukarniati & Khoirudin, 2017)	The role of institutions in the management of a people's economic business needs to be strengthened to lead to a wider market share such as a management structure with a clear job description so that the business entity formed can be maximized in its function for the progress of the people's business.
(Banu, 2020b)	The blue economy policy is a new breakthrough that is considered more efficient in utilizing existing marine resources in Indonesia because considering that Indonesia is rich in biological and non-biological potential contained in Indonesia's oceans
(Sujiwo & Nurlaili, 2024b)	The goal of blue economy development is to maintain the condition of the marine and coastal environment, while providing social and economic benefits for both the present and the future.
(Setiawan & Sudja, 2021)	There are four things that need attention to build marine in the future, namely the sustainability of natural resources in the sea, the support of reliable human resources (HR), infrastructure, and institutional systems
(Ismail et al., 2023)	Structured and systematic efforts to improve competence

CONCLUSION

Based on the results of our research, the majority of respondents believe that the blue economy has great potential to be developed in Indonesia. They also understand the benefits, including improved economy, employment, and energy security. There is strong support to improve human resource (HR) skills in supporting the development of marine energy human resources competencies based on the blue economy. Training and seminars are considered effective in improving the knowledge, abilities, and skills of Marine Human Resources. Improving HR competence is considered to have a positive impact, such as increasing efficiency, productivity, product and service quality, and competitiveness.

The majority of respondents acknowledged that the blue economy has great potential to deliver important benefits for Indonesia, including economic growth, maritime security, and preservation of marine resources. Marine energy development is considered one of the priority sectors in the blue economy by most respondents. Challenges faced in marine energy development include lack of knowledge and technology, lack of policy and regulatory support, lack of community involvement and participation, and lack of capital availability and accessibility.

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