Evaluation of The Potential of Maritime Resources of The Yogyakarta Special Region to Support the Achievement of SDG's

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Abstract. Monitoring and evaluating maritime resource potential is required to support the realization of Indonesia's vision as the world's maritime axis while increasing people's lives from maritime activities. This study aims to evaluate the potential of maritime resources and analyze the relationship between these potential resources and the characteristics of the coastal and marine physical environment in the Special Region of Yogyakarta. A descriptive-exploratory research design was used with a geographic approach, namely a complex regional approach. The subjects of this research are the marine and coastal areas of the Yogyakarta Special Region, while the research object is the potential maritime resources in the region. Data was collected by observation, interpretation of remote sensing images, literature study and documentation. The data that has been obtained is then analyzed using descriptive-quantitative analysis. The research results show that the DIY maritime region has great potential in terms of its fisheries, tourism, and energy potential. The production of caught fish is very high, averaging 4,901.03 tons year. DIY's marine resources are economically very high, with a total economic value of IDR 715,085 billion. However, the number of fishermen from 2019-2022 continues to decline drastically. The tourism sector also has enormous potential. The number of tourists from 2020 to 2022 shows a continuing increasing trend. The potential for renewable energy from the DIY maritime region can contribute 11.86% of the total electrical energy needs of the DIY community. The potential for renewable energy in the DIY maritime region also has other contributions, especially in reducing CO2 emissions by up to 11.62%.

Keywords: Maritime, resources, fisheries, tourism, energy, Yogyakarta; SDG's

1 Introduction

Humans have carried out maritime activities for a very long time as a source of livelihood. Hildebrand and Schroder-Hinrichs [1] explain that maritime is a term for all activities from or related to the sea. Maritime activities include shipping, trade, navigation, law, and even the military. This activity has been going on for centuries. It has become a monumental record in history, including the voyages of European nations to

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the archipelago as carried out by the Portuguese, Spanish, British and Dutch [2, 3]. The use of the sea as a living space, a means of transportation, and providing various natural resources for human life is increasingly being carried out in today's modern era. Coastal countries bordering seas and oceans and island countries have a great interest in maritime activities.

In Indonesia, maritime activities have been carried out for a very long time and have even become part of the national identity as a maritime nation since ancient times. Indonesia's existence as a maritime country has become stronger with the Juanda Declaration, which is recognized worldwide through international maritime law. Maritime life has existed since the 14th century and the beginning of the 15th century, which was marked by the existence of a maritime-style kingdom that controlled the trade network of the Bay of Bengal, the Strait of Malacca, the South China Sea, the Sulu Sea, as well as sea tribes who lived in various regions.

The concept of a maritime country differs from that of an island country. Kardono et al. [4] explained that according to the 1982 UNCLOS international maritime law, Indonesia is categorized as an archipelagic country because it meets the requirements stipulated in that law. However, unlike island countries, maritime countries are not defined based on physical characteristics. Maritime states are determined by the capabilities and efforts made by a state in utilizing and/or expanding its interests through maritime media. Maritime countries may not own the sea but can manage and utilize it. On the other hand, an archipelagic country may not necessarily be a maritime country if it cannot use the seas under its control. Indonesia's development as a maritime country, even as the world's maritime axis, must begin with managing and utilizing the potential in its maritime areas. The inventory of potential marine resources is a scientific gap that needs to be filled with various studies.

Since two decades ago, there have been several important issues related to maritime affairs that have become a concern at the global level. Some of these crucial issues include maritime transportation [5], oil and gas [6], fisheries [7], tourism [8], handling marine waste [9], as well as conservation and marine resource management [10]. These various issues are certainly still relevant to discuss currently. In the field of fisheries resources and providing food from the sea, for example, Cheung [11] found that the future of ocean fisheries faces threats due to global climate change. On the other hand, Costello et al. [12] calculate that food production from the sea is still high if managed well. In 2050, there is a potential for an increase in output of 36–74% compared to today. Studies like this and other aspects are essential, especially for Indonesia, which has a vision of being the world's maritime axis. Maritime resources generate many benefits for coastal economies and offer significant opportunities for recreation, local development in coastal areas, tourism, recreation and scientific research possibilities [13].

Yogyakarta Special Region (DIY) is a provincial-level administrative region in Indonesia that has maritime resource potential, namely in the Indian Ocean, which is located on its southern side. Data from the Central Statistics Agency shows that the contribution of fisheries to gross domestic product in DIY is ranked second lowest among various provinces in Indonesia during the 2017-2021 period. The volume and value of fishery exports also tend to fluctuate during this period. Many residents of seaside villages in DIY still earn their living from agriculture and have not utilized the potential

of maritime resources optimally [14]. How big is the potential for maritime resources, and do the physical conditions support maritime development in DIY? In connection with these conditions, this article evaluates the potential of maritime resources and physical conditions in DIY. This paper offers new insights into the evaluation of maritime resource potential in the small-complex region using a geographic approach.

2 Methods

2.1. Data Collection and Analysis

This research uses a descriptive-exploratory to explain the symptoms found in detail. Regarding the population, this research uses sampling to represent the population. Regarding the characteristics of the object, this research is survey research as demonstrated by a planned survey using observation sheets. Regarding the analysis, this research uses quantitative and qualitative methods. This approach describes the condition of various objects along with their variations and complexity in an area. This research also implements geographic themes in analyzing location. The subjects in this research are marine and coastal areas that are administratively included in the Special Region of Yogyakarta (DIY). The object of study is the potential of maritime resources in DIY, including fisheries, transportation, energy, and tourism.

Data was collected by observation, interpretation of remote sensing images, literature study and documentation. Observations were carried out to obtain data regarding (1) geological and geomorphological conditions of coastal areas and (2) potential resources in coastal areas. Interpretation of remote sensing imagery is used to identify potential resources in coastal areas that cannot be accessed through terrestrial surveys. Documentation is carried out to obtain data from sources in the form of documents. The data in question are the physical characteristics of coastal and marine areas including landforms, rock types, geological structures, bathymetry, wave properties and sea currents, as well as the potential of maritime resources in DIY Data sources for documentation include: (1) Indonesian Topographic Map, (2) Geological map, (3) publication of the Central Statistics Agency (BPS), (4) publication of the Ministry of Maritime Affairs and Fisheries and related agencies, (5) publication of the Oceanographic Institute National and related agencies. The data analysis methods used in this research is descriptive-qualiattive analysis.

2.2. The Study Area

This research was conducted in the DIY Maritime Area, which includes the coastal and marine areas. Astronomically, this research area is at coordinates 8749784 to 9128337 mU and 228749 to 482010 mT according to the universal transverse mercator (UTM) system zone 49S (Fig 1). The seas in the research area include the Territorial Sea, Additional Zone, and Exclusive Economic Zone (EEZ) and the Indonesian Continental Shelf. Geographically, the research area is located between various landscapes in DIY in the north and the Indian Ocean in the south. Various landscapes bordering the research area include structural, fluvial and karst. Each region has varying characteristics.

The research area has an area of 40,240.66 km2, including a coastal area of 187.26 km2 and a sea area of 40,053.4 km2. Administratively, the research area is included in three districts in the Special Region of Yogyakarta: Gunungkidul Regency, Bantul Regency and Kulonprogo Regency. In more detail, the territorial sea has an area of 2,620.72 km2 with a distance of 31.41 km from the coastline. The Territorial Sea has a depth of between 0 and 500 m. The additional zone has an area of 2,244.1 km2 with a distance of 22.53 km from the Territorial Sea boundary or 53.94 km from the coastline. This further zone has a depth ranging from 500 to 1,500 m. The Exclusive Economic Zone (EEZ) and the Indonesian Continental Shelf are Indonesia's territorial waters that border Australia. This region has an area of 35,188.6 km2 with a depth ranging from 1,500-7,500 m. The EEZ and continental shelf in the study area have the same area coverage, but the determination is based on different criteria.

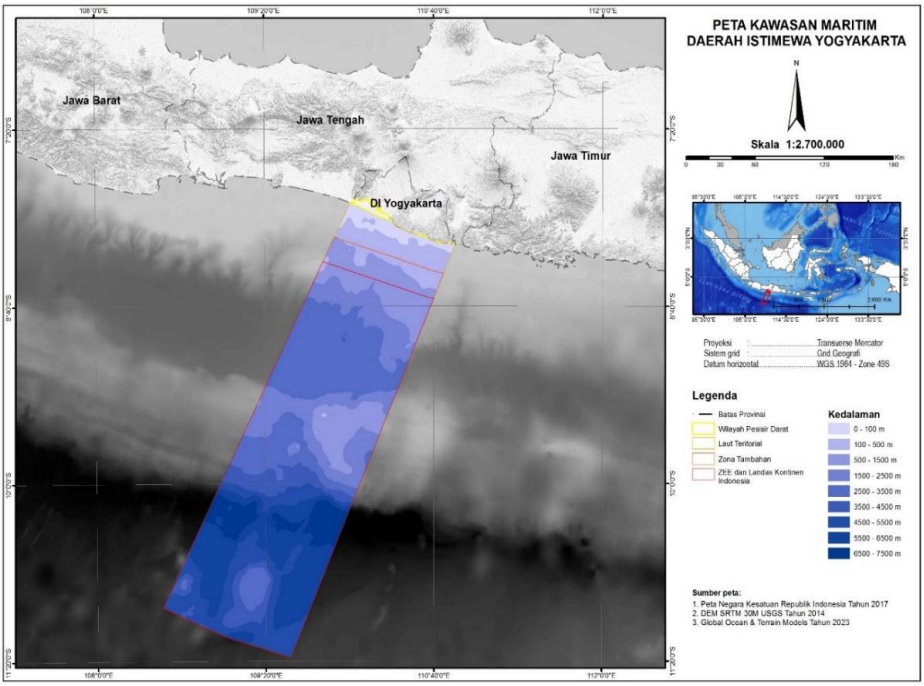

Fig 1. The Study Area

2.3 Result and Discussion

Fisheries. DIY has enormous coastal resource potential with different spatial characteristics according to the landscape. The South Coast of DIY stretches across three districts, from the Kulonprogo Regency area through the Bantul Regency area to the Gunungkidul Regency area. The characteristics of each coastal district have different characteristics and potential.

In data collected by the Yogyakarta Special Region Maritime Affairs and Fisheries Service, the number of fishermen on the southern coast of Yogyakarta in 2019 was

recorded at 5,166 thousand people. Then, in 2022, the number will decrease by almost half from 2019, when the number of fishermen was recorded at 2,127 thousand people. However, this decrease is based on the number of primary and additional part-time fishermen, which has decreased drastically. This is due to the COVID-19 factor, which has disrupted fishermen's social and economic conditions, so the part-time fishing profession has declined—actors in fishing activities at sea or related to fisheries in D.I. Province. As a prominent fisherman, Yogyakarta experiences an increase every year, influenced by the opportunities seen by the community. This activity provides an excellent opportunity to free people from the cycle of poverty.

According to Ministerial decree of Minister of Maritime Affairs and Fisheries No. 38 of 2003, the productivity of fishing vessels is also determined by considering the size of the vessel's cargo, type of vessel material, strength of the vessel's engine, type of fishing gear used, number of fishing operation trips per year, average fishing capacity. Average per trip/month and fishing area. Fixed trip costs are obtained from the average fixed costs per year divided by the average number of trips. Then, the variable costs per trip are received from the average operational costs (supplies, diesel, oil, ice, etc.) incurred each time a fishing activity is carried out. The cost of catching a trip per year is obtained from the average fishing cost divided by the average number of fishing attempts per year [15]. The waters of Gunungkidul Regency are one of the water areas with abundant fish resources in the Special Region Province Yogyakarta (DIY). These fish resources have been widely used by fishermen in Gunungkidul, so this area has become the primary producer of captured fishery products in DIY. Production of caught fish in Gunungkidul Regency is the largest in DIY [16].

Data collected by Regional Planning and Development Agency (Bappeda) based on BPS DIY data [17] shows marine fisheries production sold at fish auctions in the period 2019-2021 produced a quantity of fish of 17606.97 q in 2019, 26736.58 q in 2020, 21318.59 q in 2021. Production of fish sold at the fish auction site (locally known as TPI) experienced a decline in 2021 (Table 1). This is because fish production fluctuates up and down, and the number of fleets decreases. However, even though it experienced a decline the following year, it could increase again. Judging from the data collected above, the figures obtained are still relatively large and are very likely to experience a stable increase if there are developments in processing. The presence of TPI at each fishing port will provide significant benefits for the local government and fishermen because it is a source of retribution, especially in marketing their products. Fishermen are generally one of the social groups still marginalized, both socially and economically. Politics, through the TPI institution, it is hoped that it will become stronger, independent and empowered, especially in helping itself, because one of the functions of the TPI institution is to carry out strengthening or empowerment programs both in the socio-economic and institutional aspects of its partner fishermen [18].

Table 1. The volume of marine fisheries production sold at TPI in Yogyakarta (q)

District	Years

	2019	2020	2021
Gunung-kidul	15483,5	24639,51	19321,03
Bantul	1411,61	1290,91	1452,2
Kulon Progo	711,86	806,16	545,36
Total DIY	17606,97	26736,58	21318,59

Source: Statistical Agency of DIY [19]

In the trading process at TPI, there are several fish productions in each region. According to Sahuwaba et al. [20], they have identified and inventoried the potential of marine resources in the Special Region of Yogyakarta. As follows:

In Kulon Progo Regency, the coastal areas of Kulon Progo Regency identified as having economically significant marine resource potential (fisheries and environmental services) are West Congot Beach, East Congot Beach and the Glagah-Karangwuni Fishing Harbor Area. On West Congot Beach, the shrimp cultivation business is multiplying; East Congot Beach only has fish catching and landing activities on a limited scale as well as horticultural (vegetable and fruit) cultivation, while on Glagah-Karangwuni Beach, there are developing outboard motorboat tourism activities, fishing tourism. Fish and lobster fishing activities are rapid.

In Bantul Regency, the coastal areas of the Coast of Bantul Regency are identified as having fisheries resources and environmental services of significant economic value, namely (1) Pandansimo Beach, (2) Kuwaru, (3) Depok, and (4) Parangtritis. The types of marine businesses that stand out are (1) intensive and superintensive white shrimp cultivation businesses on Pandansimo Beach, Kuwaru and Depok, (2) fish and lobster fishing businesses with PMT on Depok Beach, (3) beach tourism on Depok and Parangtritis Beaches. and (4) culinary tourism at Kuwaru Beach, Depok and Parangtritis, which has developed rapidly.

In Gunungkidul Regency, the coastal areas of Gunungkidul Regency identified as having the potential for marine resources of substantial economic value, namely (1) Sadeng Beach (fishing port area), (2) Nampu/Wediombo, (3) Siung, (4) Sundak/Indrayanti, (5) Drini, (6) Baron, (7) Ngrenehan, (8) Gesing and (9) Purwosari. The economic activities that stand out are (1) sizeable pelagic fishing businesses using motorboats, (2) small pelagic and demersal fish and lobster fishing businesses using outboard motorboats and (3) natural seaweed harvesting businesses. Environmental services (beach and culinary tourism) have increased, especially at Baron, Indrayanti, Siung, Drini and Gesing Beaches.

Several types of fish are considered potential, such as yellowfin tuna, tuna, skipjack, layur, layang, and others. According to the data of DKP DIY [21] and Mustaruddin et al. [22], yellowfin fish is a catch a leading group of tuna in DIY, and many investors are investing in this fish business, both in catching, processing, and marketing. The production of tuna and skipjack tuna is also one of the largest and significant in DIY,

and tuna is seen using fishing gear that is relatively the same as yellowfin tuna [17]. Meanwhile, shrimp, which has potential in DIY, is white shrimp/jerbung, with production reaching an average of 27.2 tons per year [21].

Various types of marine resources in the Coastal and South Sea areas of DIY have superior and reliable commodity specifications, including tuna, skipjack, marlin, lemadang, lobster, sea laurel, snapper, catfish and shrimp, as well as coastal tourist areas that can be utilized throughout years. Tuna fish landed at the Sadeng Coastal Fisheries Port (PPP) almost annually can reach 2,500 tonnes with competitive selling prices of IDR 25,000-30,000/kg and skipjack, tuna and marlin. Lobsters can be exploited along the waters of the South Coast of DIY at competitive selling prices (±IDR 750,000 – 900,000/kg). Vaname shrimp cultivation business proliferates because local, national and export market demand is increasing with fantastic selling prices, reaching IDR 135,000/kg [20].

The Coast of DIY, which has marine resources (fisheries and Marine and Land Capture Fisheries Production Value (Millions) of environmental/tourism services) of crucial economic value are Congot and Galagah-Karangwun Beaches (Kulon Progo Regency); Pandansimo, Kuwaru, Depok and Parantritis Beaches (Bantul Regency) as well as Sadeng, Nampu/Wediombo, Siung, Sundak/Indrayanti, Drini, Baron, Ngerenehan, Gesing and Purwosar Beaches (Gunungkidul Regency). The economic value of fishery resources on the South Coast of Kulon Progo is IDR 519.817 billion (most enormous at Glagah-Karangwuni Beach), environmental services/beach tourism is IDR 0.608 billion (most enormous at Galagah-Karangwuni Beach), with a total economic value of IDR 520.425 billion. The economic value of the South Coast of Bantul fisheries resources is IDR 121.455 billion (the largest on Depok Beach); environmental services/beach tourism is IDR 2,961 billion (most significant at Parantritis Beach), with a total economic value of IDR 124,416 billion. The economic value of the Gunungkidul fishery resources is IDR 63,957 billion (the largest on Sadeng Beach); environmental services/beach tourism is IDR 6,803 billion (most significant at Baron Beach), with a total economic value of IDR 70,244 billion. The total economic value of marine resources on the Coast of DIY reaches IDR 715.085 billion. The leading commodity for marine resources on the Coast of Kulon Progo is shrimp; the Coast of Bantul is vaname shrimp; The Coast of Gunungkidul includes sizeable pelagic fish (tuna, skipjack, tuna, marlin and lemadang), small pelagic and demersal fish (layur, snapper, catfish) and lobster. All total economic values are calculated annually. So, it is not impossible that when we look at the existing potential, if optimized, there will be an increase in the total production of the fisheries sector in the Special Region of Yogyakarta [20].

Tourism. The central government is currently planning a National Tourism Strategic Area (KSPN, 2016) in DIY KSPN planning in DIY includes (1) Gunungkidul Karst Area, (2) Prambanan - Kalasan area, (3) Yogyakarta City area, (4) DIY south coast area and its surroundings, (5) Merapi-Merbabu area and its surroundings. Of all these areas, the south coast area of DIY is an exciting tourist attraction. Apart from the potential in the tourism sector, the beach has much potential that can be processed, such as seaweed farming, fishing, etc. The south coast of DIY borders directly with the Indian Ocean, which causes the beaches to become more popular and attractive for tourists [23].

According to Law Number 10 of 2009 concerning Tourism, the potential of the tourism sector needs to be developed with the hope of being able to realize the objectives of tourism management in this law, namely regarding the utilization, preservation and improvement of the quality of tourist objects and attractions, increasing national unity and integrity and a sense of love for one's country is fostered, equal distribution of business opportunities and employment opportunities, and the utilization of domestic products is encouraged. Not only that, regional leaders must also be serious and committed to realizing the program. The local government and the community must be able to support it so that what has been planned meets its objectives. Increasing visits, namely travelling to tourist attractions, is one form of community support. One of the tourism potentials in the Special Region of Yogyakarta is the tourism potential in coastal areas. In each coastal area of the district, apart from having a social system, there is also an ecosystem related to the area's natural conditions. Coastal areas can have several ecosystems, such as beach ecosystems, coral reef ecosystems, sand dune ecosystems, mangrove forest ecosystems, etc. The relationship or interaction between the social system and the ecosystem is significant in a coastal area because it will influence regional dynamics. For example, the coastal ecosystem, home to several living creatures, is also where several people depend on the tourism sector for their livelihood. Tourism is very profitable because it is one of the region's most significant contributors to PAD [24], [25].

According to Law No. 33 of 2004, it is stated that Regional Original Income (PAD) is regional income sourced from regional taxes, regional levies, separated regional wealth management results, and other legitimate regional original income, which aims to provide flexibility. To regions exploring funding and implementing regional autonomy as an embodiment of decentralization. Sources of Original Regional Income include Regional Taxes, Regional Levies, Separated Regional Management Results and other legitimate PAD. It can be seen in the number of tourism visitors on beaches throughout DIY.

Coastal tourism areas are increasingly developing, along with the support of basic and supporting facilities and infrastructure, as well as human and industrial activities in the maritime and fisheries sectors, transportation, and other sectors that help each other, as well as human needs for recreational facilities. The development of the tourism industry on the South Coast of Yogyakarta in the last ten years has increased drastically, attracting the attention of investors to invest on a small to large scale, as seen at Baron and Indrayanti beaches, Siung, Ngerenehan, Parantritis, Depok, Pandansimo, Kuwaru, Glagah, Karangwuni, and Congot. The number of foreign and domestic tourists has consistently increased in the five consecutive years from 2020 to 2022. Even though the number of tourists always increases, tourist growth also sometimes declines. In 2020, there was a recorded decrease in visitors from various beach destinations compared to 2021. This was due to post-COVID-19 conditions, which resulted in instability for tourist visitors. According to Secretary of the Tourism Service A Hary Sumono, ST (in Wulandari and Priyastiwi, 2022), the COVID-19 pandemic has affected various sectors, including the beach tourism sector, which has not been spared from the impact of the Covid-19 pandemic. The impact felt is a decrease in the number of visitors and an effect on levy income and community income. Based on this data, it can be projected

that the number of DIY tourists will increase in the next few years. This can be seen from the government's development efforts to welcome strategic national tourism areas integrated with tourism objects and other public facilities.

The increase in the number of beach tourism visitors will impact the increase in the levies on Regional Original Income. The table above shows that the contribution of fees for beach tourist attractions in 2022 will increase due to the rise in tourists. Original Regional Income in the last three districts has also increased. The income contribution that comes from beach tourist attractions is always more significant. According to Tourism Statistics data from DIY (2020-2022), the Bantul Regency always gets more significant income because there are beaches that are famous for their culture and history, such as Parangtritis Beach, which has a rapid increase in revenue.

Energy. Indonesia's territorial waters have the potential that can be utilized optimally to generate electrical energy from renewable energy sources. This energy can be created from tidal elevation, temperature differences, currents, waves and wind on the coast of Indonesia. Ocean wave energy is a potential energy source that has not been widely developed, although several breakthroughs have been made. This energy is a significant energy source and can be more reliable than most other renewable energy sources [26]. For sea wave energy in Indonesia, the southern part of Java is very suitable for renewable energy because of the high waves caused by coastal areas bordering the Indian Ocean. With wave and wind characteristics that fluctuate throughout the year in the area bordering the Indian Ocean, this region has high wind and wave strength as an implication of the Australian and Asian continents (monsoon) and borders the ocean. These wind and wave shifts fluctuate with the seasons, which last about three months [27]. On the other hand, DIY has potential renewable energy sources that can be optimized to provide electrical energy. Potential renewable energy sources in DIY include solar radiation, wind energy, waves, and Micro Hydro Power Plant (MHPP). The potential for solar radiation in DIY is 4.8 kWh/m2 /day. The wind speed along the coast of DIY is 4 to. 5 m/sec. The potential capacity of wind power reaches 10 to 100 MW [28].

The total potential of MHPP in D.I.Y. Province is 1,188.6 q. Currently, PLTB has been developed by the Space Research Institute (LAPAN) and the Center for Energy Studies, UGM, among others. It has been installed in the Samas, Sadeng, Parangtritis, Srandakan and Baron areas. Wind Energy Power Plant Program (wind) in Samas is one of the most significant projects in Indonesia. Later, 33 tall windmills will be built 120 meters with a capacity per wheel that can produce two million watts. The amount produced is significant because it can reach 1/8 of the electricity needs in Yogyakarta [29]. At Pandansimo Beach, there is also a hybrid power plant. This power plant has provided a solution to meet the electrical energy supply. The Pantai Baru Pandansimo hybrid generating system is integrated with two power plants: a solar power plant (photovoltaic arrays) and a wind power plant. The Pantai Baru Pandansimo hybrid generating system has 238 solar panel units and 34 wind turbine units capable of producing 90 kW of electrical power. There are three power plants at the Pantai Baru Hybrid Power Plant: the western, the eastern, and the KKP. In the group of the west, there is a 240 V wind turbine system and a 120 V solar panel system with a total capacity of 36 kW. In the

eastern group, there are 48 V, 120 V and 240 V generating systems consisting of solar panels and wind turbines with a total capacity of 44 kW. In the KKP group, there are only solar panels with a system that is 48 V and has a total capacity of 10 kW [30]. According to BAPPEDA DIY [17], the total energy production capacity of BAYU power in DIY has been stable from 2019-2022, namely 100.00 MW per year.

Apart from the potential for renewable energy, such as BAYU alternative energy, there are other alternative energy sources, namely wave energy. Generally, sea wave heights in all coastal waters south of Yogyakarta are relatively similar. Waves are pretty high and vary between 0.3–3.0 m, with an average wave height generally ≥ 1.2 m. Sea waves in several coastal waters have typically a wave period of 6.0 and 18.6 seconds with an average wave period of ≥ 10 seconds. The observation time is part of the transitional season period, but the waves are relatively high in some coastal waters. The maximum wave height for all beaches is found in the waters of Kukup Beach at midday observations, and at that time, the tide is in high tide. The wave direction is generally observed from the south to the southwest following the seasonal wind direction conditions. Furthermore, the wave energy varies between 0.6–4.5 kW/m. Waves observed on the south coast of Yogyakarta generally have high energy characteristics because they are directly adjacent to the open sea. During the west monsoon period, wave energy tends to be higher because the west monsoon winds tend to be stronger, resulting in larger waves. The strength of the wind affects the height of the waves. So, this season, there is a superposition between tidal wave energy and waves caused by stronger winds during the west monsoon period, generating enormous waves that reach 2–3 m in height. Meanwhile, the wave height and average wave period during the west monsoon period are around 1.9 m and 11.5 seconds, respectively. Waves with high energy tend to cause coastal damage and erosion, forming steep land. Large waves can also function as

beach builders, causing currents and sediment transport in perpendicular directions and along the coast. However, coastal damaging waves usually have high height and energy [31].

Based on the renewable energy development scenario, the role of renewable energy in providing electrical energy in DIY is very significant. This is demonstrated by renewable energy's contribution to providing electrical energy, which is 11.86% of DIY's total electrical energy needs. Besides contributing to the supply of electrical energy, developing renewable energy can reduce the CO2 emissions produced due to electrical energy generation activities. In the simulated development scenario, the role of renewable energy in Reducing CO2 emissions reached 11.62% of CO2 emissions without renewable energy [32]. The maritime energy potential of DIY, if managed optimally, will be very important to support the achievement of SDGs, especially related to the provision of renewable energy. A report from the United Nations [33] shows that clean energy in developing countries is still insufficient. Currently, 660 million people still lack electricity, and 1.8 billion people will not have access to clean cooking by 2030. Achieving universal access to energy by 2030 requires accelerating electrification and increasing investment in renewable energy. As such, the findings of this study are critical in terms of renewable energy investment.

3 Conclusion

The DIY Maritime Area has great potential in terms of its fisheries, tourism and energy potential. The production of fish caught in the DIY Maritime Area is considered very high, with an average of 4,901.03 tons/year. Economically, marine resources in the DIY Maritime Region are also very high, with a total economic value of up to IDR 715,085 billion. However, the number of fishermen from 2019-2022 continues to decline drastically. The tourism sector also has enormous potential. The number of tourists from 2020 to 2022 shows a continuing increasing trend. The increase in the number of tourists every year significantly impacts local revenue. Regional original income from levy collections in 2022 alone could reach 52 billion. Apart from that, the potential for renewable energy (solar, wind and waves) in the DIY Maritime Area also dramatically contributes to meeting the electrical energy needs of the DIY people. The potential for renewable energy can even contribute to reaching 11.86% of the total electrical energy needs of DIY people. The potential for renewable energy in the DIY Maritime Region also has other contributions, especially in reducing CO2 emissions by up to 11.62%.

This research has succeeded in identifying and analyzing the potential maritime resources of DIY. Further research is highly recommended to examine community motivation, especially in increasing the number of fishermen around the DIY Maritime Area. Another recommendation could be to conduct a study regarding optimizing renewable energy potential in the DIY Maritime Area to contribute to sustainable development programs.

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