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# Wind Energy Potential in Coastal Areas of Merauke City

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**ABSTRACT:** Energy transformation to new and renewable energy starts from the green economy, green technology, and green products. The electricity demand in 2060 reached 1942 TWh which was dominated by the industrial and transportation sectors. Electricity demand is supplied by 96% renewable energy and 4% new energy with a total capacity of 708 GW. Merauke city with a geographical location between 137-141 degrees and 5-9 degrees of 46,791.63 km$^2$ is a flat area and has several coastal areas, namely: Lampu Satu beach, Payum beach, and Domande beach with a beach length of 846.36 km. The method used is Topographical analysis, Google map and ESDM one map. Merauke city has two potential areas for wind energy, namely plains with a green spectrum having wind speeds of 4-6 m/s while beaches coastal with a red spectrum wind speed exceeding 6 m/s. For an altitude of 50 meters from the ground at coordinates 141.59621 - 8.04586 degrees, green area with wind speed of 4.27 m/s, area of 0.99 km2 and Musamus University at coordinates 140.47110 - 8.103640 degrees, wind speed 4.97 m/s for an area of 0.99 km2. The point 141.563250 - 8.040420 degrees is placed on the . Lampu satu beach wind speed 8.04 m/s, Domande beach 6.56 m/s, Payum beach wind speed 6.75 m/s.

**KEYWORDS:** Wind Energy, Coastal Areas, Potential Energy, Renewable Energy

## 1. INTRODUCTION

Green economy encourages the creation of inclusive and sustainable economic development [1]. The demand for electricity in 2060 will reach 1942 TWh which is the highest in the world of industry. The highest demand will come from 96% renewable energy and 4% new energy from nuclear power plants with a total capacity of 708 GW [2][3]. South Papua Province (PPS) was formed through Law no. 14 in 2022 officially on July 25 2022 and the capital city is Merauke [4]. PPS has two areas of wind energy potential, namely coastal/sea and inland areas with wind speeds of 4-6 m/s [5]. The area of South Papua is 117,833.92 km2. Geographically, the northern part of PPS is bordered by the Province of Papua Mountains, to the east by the Province of West and Papua New Guinea, to the south of the Arafura Sea and to the west by the Arafura Sea and Central Papua [6]. New Renewable Energy Commodities (EBT) for wind energy potential in 2020 will reach 60.6 GW in updated data in 2021 to 94.2 GW [5]. In 2025 the projected wind energy is 657 GW, in 2040 it is 10,124 GW and in 2060 it will reach 39,226 GW [5]. The General National Energy Plan (RUEN) forms the basis for the formation of the regional general energy plan (RUED) for the province, RUEN Peppres no. 22/2017 [7]. Utilization of local energy can help dependency on commercial energy [8].


**Figure 1**. The Mapping of South Papua Province [8]

## 2. Materials and methods

Method used is a direct observation regarding the potential renewable energy in the Merauke city area of South Papua. Data collection and analysis was carried out using GPS, ESDM one maps and Google Earth.

### *2.1. Google Earth*

The design model uses the Google Earth application as a comparison of potential regional coordinate points in Merauke City. The influence of climate on wind energy in coastal areas is very influential [9]. The atmosphere and the physical, dynamic phenomena of sea water in an area affect the production of wind energy in that [10].


**Figure 2**. Map of Papua Province based on Google Earth

### *2.1. One Map ESDM Model*

Data analysis and coordinates for wind energy potential in Merauke city:

**Figure 3.** The One Map ESDM Model

## 3. Results and discussion

Merauke city is geographically located between 1370-1410 East Longitude and 50-90 South Latitude [4][11]. Merauke ESDM data has wind energy potential, namely for the green color it is at a wind speed of 4-6 m/s and for the red color the wind speed is > 6 m/s [12]. Wind speeds above 3 m/s have a wind potential of 170 W/m2 [13].

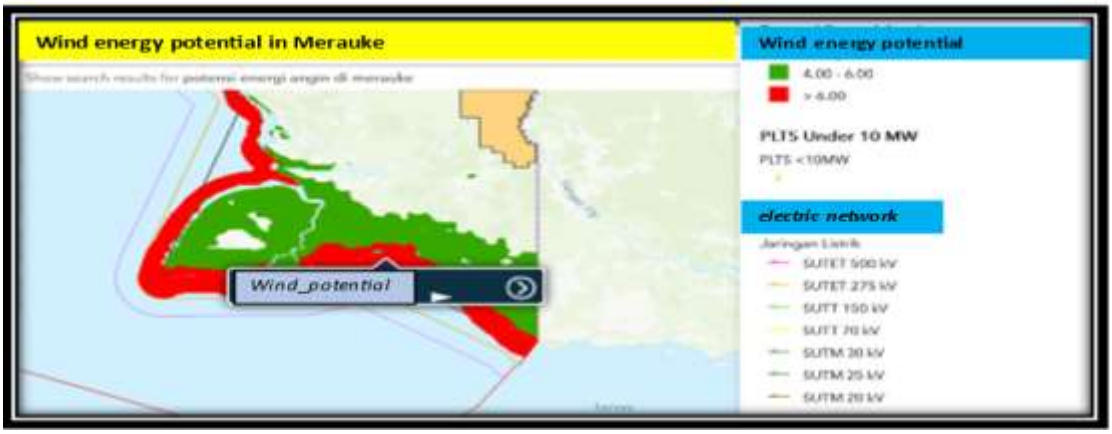


**Figure 4. Data of ESDM refere to wind speed (V) = 4.00-6.00 m/s**

The land location and coast are potential areas for wind energy. For land data, namely Musamus University and coastal data, namely Lampu Satu Beach, Payum Beach, and Domande Beach. Wind speed and temperature in the area affect the availability of power [11]. Recommendations for PV-wind hybrid systems for coastal areas [14].

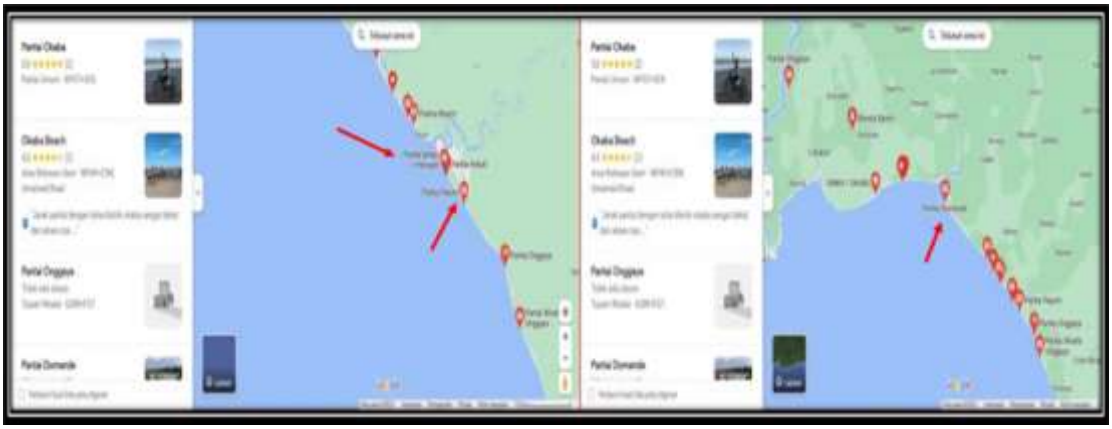

**Figure 5. The object of research in the coastal area (Lampu Satu beach, Payum beach, and Domande beach)**

Wind energy data shows a green area in Merauke of 4.06 – 6.60 m/s. This data is similar when compared to the wind speed data from ESDM, which is 4.00 – 6.00 m/s.

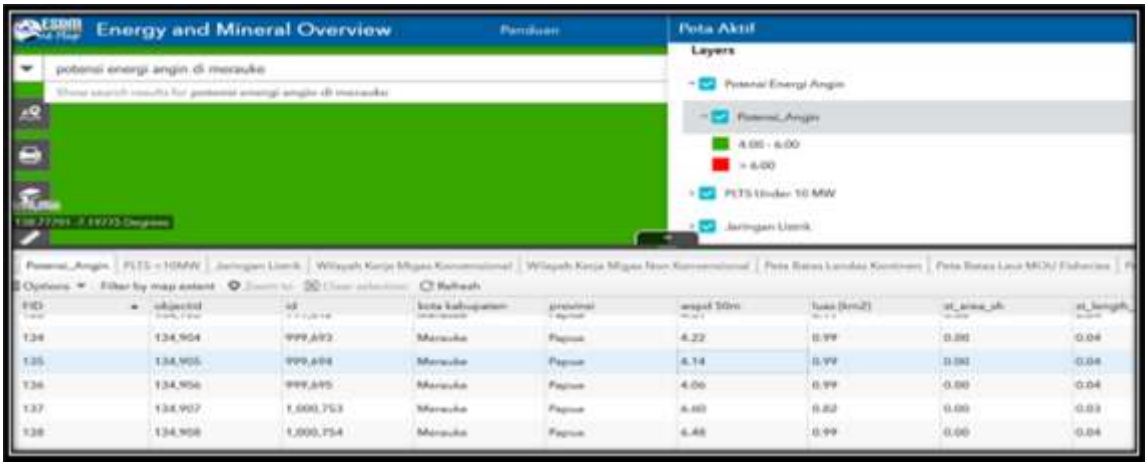


**Figure 6. The Data of green area Merauke city**

Wind speeds greater than 6 m/s (> 6 m/s) in the coastal areas of Merauke City, South Papua Province are indicated by the red area as seen in Figure 7.

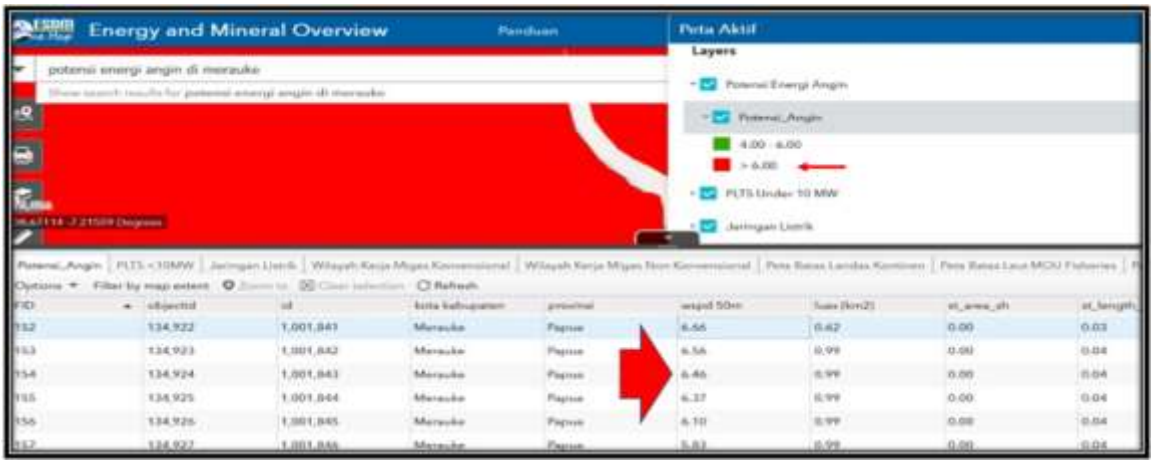


**Figure 7. The Data of red area Merauke city**

For the green plains area of Musamus University at coordinates 140.470110 BT -8.103640 LS with a resulting wind speed of 4.97 m/s.


**Figure 8. The Location of Musamus University**

Lampu Satu Beach is located on the outskirts of Merauke city and is a local tourist attraction. The beach is connected to the open sea at coordinates 140.03676 BT– 8.37665 LS and the wind energy it produces reaches 8.04 m/s.


**Figure 9. The Data of Lampu Satu Beach**

The wind energi of Domande Beach is quite good with an average wind speed reaching 6.56 m/s.

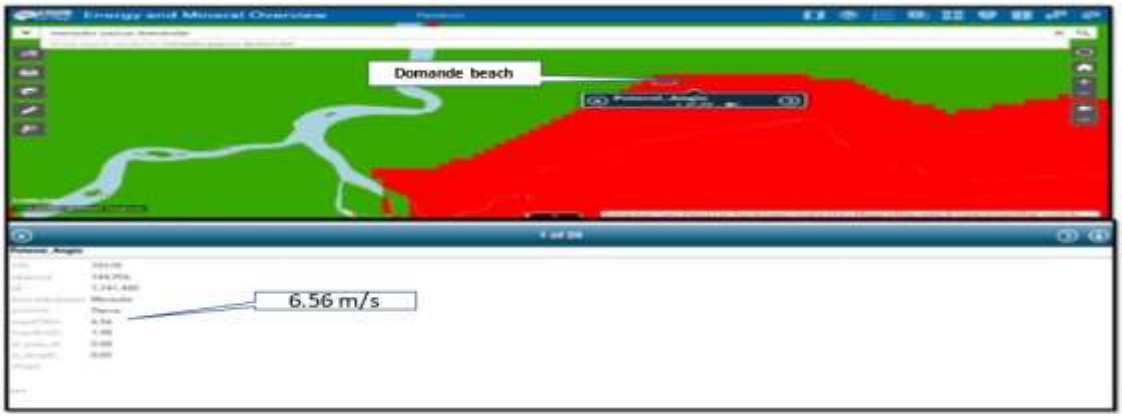


**Figure 10. The Data of Domande Beach**

The Payum Beach is also located on the outskirts of Merauke city and generates wind speed of 6.75 m/s as shown Figure 11, indicated a good potenstial wind energi.


**Figure 11. The Data of Payum Beach**

## 3. CONCLUSION

The wind energy potential in South Papua, particularly in the Merauke City, is quite promising, namely in the position of the plains Musamus University with a wind speed of 4.97 m/s and then coastal areas including the coast of Lampu satu wind speed of 8.04 m/s, Payum beach wind speed of 6.75 m/s, and Domande beach wind speed of 6.56 m/s. There are differences in wind speed in the three coastal areas.

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