

# Is it Possible to Develop Renewable Energy as a Learning Media at a University in The Coastal Area of Indonesia?

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**Abstract.** Climate change is a problem that, if left unchecked, will threaten the lives of living things on Earth. The use of renewable energy can be a solution to this problem. This can be started by making it a learning medium at university. This research is a descriptive-analytical study conducted at Raja Ali Haji Maritime University. The study aims to analyze the possibility of building renewable energy as a learning medium at the university by considering aspects of regional conditions, including exposure to sunlight, wind power, and sea wave power. With its area located in the coastal area, the development of renewable energy as a learning medium is possible at Universitas Maritim Raja Ali Haji. The habituation of students to using renewable energy can be started by universities that facilitate the development of renewable energy as a learning media that can be used by students.

## 1 Introduction

One of the main problems that threatens life on earth today is climate change. Climate change is generally caused by greenhouse gas emissions in the atmosphere, some of which are the result of various human activities [1,2]. Among the activities that emit greenhouse gases are related to energy-producing technology, transportation, and others [3]. For the worsening of climate change [4,5]. Climate change causes various problems for the lives of living things on earth [6–8].

This condition certainly cannot be allowed to continue. To realize human welfare on earth in 2030, the UN has echoed the concept of sustainable development goals (SDGs) [9,10]. 2 of the 17 goals to be achieved in the SDGs are Affordable and Clean Energy (G-17) and Climate Action (G-13) [11,12]. These two goals are interrelated, where through the use of environmentally friendly renewable energy, greenhouse gas emissions will be reduced, thereby reducing the impact of environmental change [13,14].

The use of renewable energy must continue to be campaigned and introduced, one of which is through learning. Through learning, students can learn how the use of renewable

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energy can create a quality environment [15]. Through learning, students can also differentiate the differences in the impacts on the environment produced by renewable energy and non-renewable energy [16,17]. Through this, it is hoped that students who are at an age where they have mature thinking will be able to choose and use various energy sources wisely in order to create a comfortable environment for various living creatures to live in [18,19].

In universities, renewable energy sources can be a good learning medium for students. Among the courses that are related to the topic of renewable energy is the physics course [20–22]. How renewable energy works or its mechanisms and uses can be studied in full in physics courses [23–25]. To make renewable energy a medium for learning physics at university, various abiotic factors of the university environment need to be considered. This aims to ensure whether the conditions around the university allow for the development of renewable energy. For this reason, a study was conducted to determine whether the regional conditions at universities in the coastal areas of Indonesia allow for the development of renewable energy as a medium for learning.

## **2 Methods**

This research is descriptive-analytical. The research was conducted by analyzing the condition of the area to determine the possibility of using renewable energy as a learning medium at the university level. The research was conducted at the Universitas Maritim Raja Ali Haji (UMRAH), which is located in the coastal area of Tanjungpinang City, Riau Islands, Indonesia. The condition of the area analyzed in this study was the condition of the area around UMRAH to determine the possibility of building renewable energy as a learning medium that can be used by students. The condition of the area studied was limited to exposure to sunlight, wind speed, and the strength of sea waves. Data collection techniques were carried out through observation and literature review. Data were analyzed and presented descriptively.

## **3 Result and Discussion**

The results of this study will be presented in several sections, referring to the conditions of the area analyzed. The details of the research results are as follows.

### **3.1 Sun Exposure**

Sunlight exposure can be used as a renewable energy source. To use sunlight as a renewable energy source to the maximum, areas with tropical climates are the right choice [26,27]. UMRAH itself is located in the coastal area of Tanjungpinang City, which has quite hot weather. Several research results show that the maximum temperature achieved in Tanjungpinang City ranges from 31<sup>0</sup>-32<sup>0</sup> C [28–31]. In concept, air temperature and duration of sunlight are interrelated [32,33]. The maximum temperature reached in the Tanjungpinang city area, apart from being located near the sea, is also due to the city's high exposure to sunlight, considering that Indonesia is a country with a tropical climate [34,35]. Due to the characteristics of sunlight exposure, solar cells, as a technology that produces energy from sunlight, are suitable for use in UMRAH as a learning medium for renewable energy topics. Through its use as a learning medium, students will be able to learn that the sunlight that is felt every day can be used as an energy source that can help various human jobs [36,37].

### 3.2 Windspeed

Just like sunlight, wind can also be used as a renewable energy source. The utilization of wind to produce energy can be done through windmills [38,39]. The amount of energy produced depends on the speed of the wind that turns the turbine, where the greater the wind speed, the greater the energy produced [40–42]. In coastal areas, the wind blows harder [43–45] due to the difference in temperature between land and sea [46,47]. With the condition of the UMRAH area, which is on the coast, wind speed can be utilized to construct windmills as a renewable energy source. This windmill can be used as a learning medium for students to find out how windspeed affects the amount of energy produced by windmills. Windmills are generally used to convert kinetic energy from the wind that drives the mill, then converted into electrical energy [48–50].

### 3.3 Power of Sea Waves

Renewable energy sources are not only limited to sunlight and wind power. Another renewable energy source is ocean waves [51,52]. As a maritime country whose territory is dominated by the sea [53,54]. This vast sea area certainly has the potential to be used for various things, one of which is to be converted into electrical energy [55,56]. In the research results of [57], It is explained that the requirement for selecting a sea whose sea wave strength can be utilized as a source of energy is a beach with large sea waves. Because the region consists of various islands whose positions between islands are not so far apart, sea waves in the Riau Islands region are relatively smaller [58] compared to the strength of sea waves in the Sumatra region and the south of Java Island, which are directly facing the Ocean. With these wave strength conditions, the strength of sea waves cannot be optimally used as a source of renewable energy in the UMRAH campus area because in order to produce large amounts of energy, large sea wave strength is needed. At certain times, the wind blows harder in the Tanjungpinang City area, which, of course, affects the strength of sea waves, but if it is to be used all year round, of course, the strength of sea waves cannot be optimized. This does not indicate that the strength of sea waves around the waters of the UMRAH area cannot be used as a learning medium for renewable energy, but it will be more optimal if the strength of the sea waves is large enough.

## 4 Conclusion

Based on the results of the analysis conducted, the UMRAH area is suitable for the development of renewable energy technology as a learning medium for students through the utilization of sunlight exposure, wind power, and sea wave power. This is because the condition of the UMRAH area is quite close to the sea. The habituation of students in using renewable energy can be started from universities that facilitate the development of renewable energy as a learning medium that can be used by students.

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