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Sustainable Energy for Sorong's Fishermen: Solar Panel Technology Implementation

1st Dwi Haryanto
Studi Nautika
Politeknik Pelayaran Sorong
Sorong, Indonesia
dwiharyanto75@gmail.com

2nd George William
Manajemen Transportasi Laut
Politeknik Pelayaran Sorong
Sorong, Indonesia
george39.pipmks@gmail.com

3rd I Komang Gita Purusotama
Permesinan Kapal
Politeknik Pelayaran Sorong
Sorong, Indonesia
gitapurusotama@gmail.com

4th Dwiki
Studi Nautika
Politeknik Pelayaran Sorong
Sorong, Indonesia
dwikipolipeso@gmail.com

5th Ryan Puby Sumarta*
Manajemen Transportasi Laut
Politeknik Pelayaran Sorong
Sorong, Indonesia
rps55982@gmail.com

***Abstract*— The decrease in the quantity of fishermen residing in Sorong City serves to underscore the considerable operational costs that they encounter, primarily attributable to unpredictability in catches and fuel usage. This study investigates the capacity of solar panel technology to mitigate these obstacles by supplying fishing vessels with sustainable energy sources. Despite being widely adopted on land, solar panel technology continues to be underutilized in marine environments, particularly within the fishing industry of Sorong City. The purpose of this study is to examine the advantages of installing solar panels to illuminate fishing vessels in Sorong City in order to provide practical suggestions for ensuring the sustainability of the industry. The study employed a descriptive qualitative research design, incorporating methods such as interviews, documentation review, and literature review. The installation of ten solar panel lighting systems yielded several benefits, including decreased dependence on fossil fuels, improved economic and operational sustainability, enhanced safety during operations, and social advantages. The study makes a valuable contribution towards facilitating the integration of solar panel technology into the fishing sector by establishing a framework for policies that encourage the adoption of this technology in fishing communities.**

Keywords*— *Solar panel, Fishing vessel, Renewable energy, Sorong

I. INTRODUCTION

A significant commodity in the daily lives of fishermen is water. For instance, according to BPS data, the number of fishermen in the city of Sorong, which is situated in the southwestern region of Papua and encompasses an area of 1,105 km2, was 612 in 2015. However, over time, this figure declined, and as of 2017, the number of fishermen in Sorong city had decreased to 471 individuals.

It is evident from field observations and interviews with local fishermen that the primary challenge faced by fishermen in Sorong city is the substantial operational expenses associated with venturing to sea, compounded by the unpredictability of their catch. Fuel oil (BBM) serves as both the power source for the engine drive and the generators that provide illumination for the vessel. The proposed solution to decrease fuel oil consumption is the implementation of environmentally sustainable renewable energy sources.

Concerns regarding renewable energy have risen significantly in international initiatives to mitigate the adverse effects of climate change. Renewable energy is an enduring source of power derived from sustainable natural processes, including sunlight, waves, wind, and water, which utilize natural resources [1]. As a frontrunner in this industry, solar panel technology presents tremendous potential as a sustainable and efficient energy source.

Solar panels, as stated by the International Renewable Energy Agency (IRENA), are a rapidly expanding renewable energy technology that is assuming an ever more significant function in the worldwide energy revolution. Globally, the installed capacity of solar panels amounted to 710 GW by the conclusion of 2020. During the same year, an estimated 125 GW of additional capacity was added, representing the most substantial capacity expansion of any renewable energy category [2].

Lighting is an essential function of solar panels, as the energy converted from the sun into electrical power can be utilized to supply illumination. In order to illuminate the streets and provide ablution stations in the musala of Da'watul Khair Kota Banjarbaru, solar panel technology was implemented [3]. Despite its notable implementation on land, the utilization of solar panel technology on boats, particularly fishing vessels in Sorong City, remains restricted. This presents an opportunity to investigate this untapped market.

A study conducted in Padang City examined the application of solar panel technology across multiple sectors, one of which was the illumination of fishing vessels [4]. An additional investigation into the application of electrical energy as a lighting source on a bagan tancap is critical for fishing [5].

Overall, solar panels have proven to be a viable solution for meeting the electricity demands of terrestrial areas. However, their utilization at sea, particularly on fishing vessels, remains uncommon, particularly in the city

of Sorong. Consequently, there exists a substantial opportunity to advance and deploy solar panel technology on fishing vessels with the aim of enhancing the efficiency and sustainability of the shipping industry in Sorong City.

Consequently, this study's objective is to investigate the implementation of solar panel technology in the illumination system of fishing vessels in Sorong City. This study intends to investigate its advantages for fishing vessels. By attaining a more comprehensive comprehension of the degree to which solar panel technology can be optimized to fulfill the illumination requirements of fishing vessels, it is anticipated that this study will furnish pragmatic recommendations for enhancing the shipping industry's sustainability and efficiency, specifically in Sorong City.

II. Method

The present study utilizes a descriptive qualitative research design. By implementing an assortment of natural processes, descriptive qualitative research investigates phenomena that occur within a particular context. This research consists of discourse involving exposure to words and language, conducted in a distinctive natural setting, and facilitated by a diverse range of natural methodologies [6]. Consequently, in the following discourse, the author endeavors to elucidate the results of every study and research endeavor undertaken regarding a specific subject matter.

For data collection, interviews, documentation, and a review of the relevant literature were utilized. In Sorong City, ten fishermen were consulted regarding the advantages of solar panels as a means of lighting fishing vessels. The study was executed at the Class I Port of Sorong City throughout the months of April through August in the year 2023. The materials utilized in the research were solar panels, batteries, and light bulbs. Following the collection of data, an analysis was performed, which encompassed data reduction, data presentation, and the formulation of conclusions [7].

III. Result and Discussion

Ten solar panel lighting systems were installed in the homes of fishermen in the city of Sorong, and the researcher conducted in-depth interviews with the fishermen to determine the advantages of solar panel lighting.

Fig. 1. Solar panel installation on fishing boat

The findings of this research underscore several noteworthy advantages that can be obtained by installing solar panel lighting systems on fishing vessels in Sorong City. An examination of these advantages is crucial for comprehending the favorable ramifications and prospective transformations within the fishing sector.

One potential benefit of installing solar panel lighting systems on fishing vessels is a significant reduction in reliance on fossil fuels. These systems rely primarily on solar energy, which is a clean and renewable resource. Consistent with international endeavors to mitigate carbon emissions, the environmental repercussions of fishing vessel operations can be simplified through the reduction of fuel consumption.

Additionally, operational sustainability stands out as a primary advantage imparted by solar panel lighting. Fishermen vessels can virtually always depend on the resources at their disposal by harnessing the abundant solar energy in tropical regions like Sorong City. This mitigates reliance on fuel supply and guarantees uninterrupted operations, even in situations with limited sunlight.

Thirdly, the implementation of solar panels also yields economic advantages. Although the initial investment in solar panel installation may present a financial obstacle, the long-term benefits can yield a substantial return on investment. Enhanced fuel efficiency and engine upkeep, in conjunction with possible governmental subsidies and assistance, have the capacity to generate favorable economic circumstances.

Enhanced safety during maritime and fishing operations constitutes a further significant advantage. Nighttime illumination that is dependable can increase crew safety, decrease the risk of collisions, and improve visibility in dark waters. Furthermore, sufficient illumination promotes enhanced efficiency in the manipulation of the catch.

Furthermore, this context also gives rise to social benefits. Optimal illumination enhances the working environment for fishermen, enabling them to extend their work hours and increase their productivity. Enhanced welfare of coastal communities and a potential rise in the income of fishermen may result from this.

In summary, the findings of this research demonstrate that the installation of solar panel lighting systems on fishing vessels in Sorong City can yield numerous advantages encompassing safety, social welfare, environmental and economic sustainability, and operational sustainability. This discourse lays a significant foundation for fostering the integration of solar panel technology into the fishing industry and for the formulation of policies and incentives that are conducive to its implementation. Additionally, it provides a solid basis for encouraging the adoption of this technology among fishing communities.

IV. Conclusion

The inquiry into the implementation of solar panel lighting systems on fishing vessels in Sorong City has unveiled a multitude of benefits spanning multiple aspects. The use of clean and renewable solar energy has significantly decreased dependence on fossil fuels, which is in line with international initiatives to reduce carbon emissions in the fishing industry. The utilization of ample solar resources by vessels increases operational sustainability by guaranteeing uninterrupted operations, even in conditions of low light. Despite the initial expenses, economic advantages become apparent in the form of improved fuel efficiency and possible

governmental assistance. The installation promotes increased visibility and decreased collision risks, thereby enhancing safety during maritime activities. In addition, the social advantages, including enhanced labor conditions, prolonged work schedules, and heightened efficiency, contribute to the general well-being of coastal communities and the financial stability of fishermen. The results of this study offer a significant basis for supporting the incorporation of solar panel technology into the fishing sector, informing the development of policies, and promoting the extensive acceptance of this technology among fishing communities.

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