

Proposed Solar Street Lights Installation as a Road Safety Measure in Preparation for National Road Category Transition of Megadike West Bypass Road

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Abstract: - Street lights are necessary and contribute to the enhancement of safety and the transfer of necessary services, goods, or people in a community. Several studies show that insufficient or absent road illumination significantly causes road accidents that can risk people's lives. Several studies show that insufficient or absent road illumination significantly causes road accidents that can risk people's lives. Moreover, the lack of street lights along Megadike West Road, Santa Rita, Pampanga, affects and influences the safety of its road users. The researchers gathered the information required to complete and achieve the purpose of the study. The process included the gathering of data about the road accidents that occur at Megadike West Road, Santa Rita, Pampanga. The data collection of road specifications and possible existing standard guidelines for installing solar street lights was acquired by the Department of Public Works and Highways. Through the existing guidelines and standards for installing streetlights and supporting details of existing studies, the researchers were able to make and accomplish the proposal for a solar streetlight installation design layout plan. The installation layout plan design of solar street lights for Megadike West Road, Santa Rita, Pampanga, was made, proposed, and established to improve the safety of road users and lessen the occurrence of accidents on the said road.

Key Words: — *Road, Accidents, Safety, Solar Street Lights, Installation, Absence, Guidelines, Layout Design*

I. INTRODUCTION

Roads are crucial and essential for the constant transfer of goods, services, supplies, and people from one location to another, often at a significant distance from the mainland of the nation. The transportation system of the nation helps in increasing and improving economic growth if it is effective, suitable, dependable, and safe.

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Technology and scientific principles have to do with the operation, planning, useful design, and the management of transportation facilities to authorize the comfortable, safe, rapid, economical, convenient, and environmentally friendly movement of road users and items or products. Additionally, roads are necessarily important for promoting equitable economic development. Drivers may feel more secure using the roads as their mode of transportation if the route involved is risk-free and easy to navigate. Providing the needed and adequate number of street lights can contribute to and help reduce the potential road crashes and accidents that may occur.

There are a wide range of factors and reasons that can cause accidents on the road. These factors include poor road conditions, improper use of the road, and improper compliance with road rules and etiquette. Moreover, a lack of adequate

street lighting may also be one of these factors, particularly at night. The street illumination provided by street lights enables drivers and road consumers to see objects in their way with greater clarity and visibility. Street illumination contributes to increased road safety. According to the study of Ziakopoulos and Yannis (2019), the safety of the roads in modern societies has become a serious concern since collisions result in significant yearly financial and human losses. This is due to an increase in the number of automobiles on the road. The road must be in good condition and safe for use since it is one of the most valuable assets for the movement of people and goods.

The ability of street lighting to contribute to the preservation of social order and the suppression of criminal activity was a major factor in its widespread adoption. Based on the study conducted by the Royal Society for the Prevention of Accidents (2018), the report's findings by the Department of Transport in 2003, street illumination improves and has a significant impact on the road safety of road users. The results of the survey show that 73 percent of participants believed that improved street lighting would make children safer, and 63.8 percent believed it would reduce traffic accidents. This provides support for the idea that installing street lights to provide adequate luminance on roads is important and beneficial to both individuals who drive on the roads and any other factors that may be involved.

Many road users usually travel at night or in the dark early in the morning for a purpose. Megadike West Road, Santa Rita, Pampanga, is an accessible and practical road that people can use, particularly motorists and cyclists traveling from Eco Park to Porac or vice versa. Based on the observation of the researchers, the said road has no existing streetlights. Furthermore, some parts of the road are also covered by tall, uncut grass, which obstructed the view of the path. Based on the number of news reports about the accidents occurring on the said road, vehicular accidents between motorists occur frequently at Megadike West Road, which poses a threat to the drivers and community. The absence of street lighting along the route is what the researchers want to ameliorate. This issue is necessary to lessen the road collisions brought on by the lack of road illumination. The installation of street lights along a road is a means of increasing the safety of the people who use the road. Additionally, it also makes the road more reliable and dependable for mobility. The primary concern of this investigation is to promote the effectiveness of the transportation system and the safety of those who use it.

This study proposed and evaluated improvements needed to enhance the safety and efficiency of Megadike West Road, Santa Rita, Pampanga, as a road transport route. The researchers observed that this route possesses problems that call for remedies and advancements. The aforementioned route is frequently referenced in relation to traffic collisions. It is often used by people, particularly those who travel from Eco Park to Porac or vice versa. Based on the investigation and assessment of the researchers, there are not enough street lights on the aforementioned road. These problems are necessary to address to prevent and reduce transportation issues and the risks they may cause or bring to the community. The need for street lights on Megadike West Road, Santa Rita, Pampanga, is investigated and observed. The researchers came to the conclusion that it would be beneficial to make recommendations and proposals for an applicable, suitable, and efficient layout of the installation of solar street lights in order to maintain safety and provide a solution to alleviate the number of road accidents that took place on Megadike West Road, Santa Rita, Pampanga.

II. METHODS

The main purpose of this study is to provide a workable installation design layout plan for solar street lights in Santa Rita, Pampanga, Megadike West Road, which improves the standards and safety of the transportation system provided by the route. This study used a qualitative research design method and approach. This is where the researchers adopted the approach of record keeping, in which they utilized existing reliable documents, guidelines, information, and data as their reference. The researchers conducted a diagnostic study to accomplish and acquire the objectives and goals of this study. The determination and inception of the transportation problem, demand, and issues caused by the lack of street lighting at Megadike West Road of Santa Rita, Pampanga, that are intended to be resolved or improved are included in the fundamental steps. The researchers sought solutions and proposed an accurate design layout, placement, and installment plan for solar street lights that would cure or make the problem less evident.

The data needed to support this study was gathered through investigation, observation, and collection. The researchers went to the Megadike West Road at Santa Rita, Pampanga, to examine and analyze the road regarding the absence of street lights. Important road characteristics like width and length were gathered and observed. The researchers requested the approval of the letter to the university administrator to formalize and

ensure the validity of the data gathering so that it can be presented in the offices where the data was gathered. First, the researcher went to the Philippine National Police headquarters in Santa Rita, Pampanga, to collect data about the road accidents that occurred along the Megadike West Road in Santa Rita, Pampanga. Then, the road lighting guidelines are collected from the Department of Public Works and Highways, Regional Office (Region 3-Pampanga). After that, the researchers also went to the Department of Public Works and Highways, Pampanga Second District Office at Guagua, Pampanga, to collect data for road specifications such as length and width. The collected data are evaluated to fulfill the objectives of the study. Additionally, these data are used by the researchers to complete this study section successfully.

Using AutoCAD software, the researchers generated an effective design for the placement of the solar street lights along Megadike West Road in Santa Rita, Pampanga. In design, it adheres to the rules and specifications that have been established for creating street lighting in accordance with the standards and requirements of the lighting guidelines for roadways of the Department of Public Works and Highways

III. RESULTS AND DISCUSSION

Table.1. Road Accidents in Megadike West Road, Santa Rita, Pampanga

Road Accidents Resulting In	No. of Accidents (2021)	No. of Accidents (2022)
Homicide	0	6
Physical Injury	12	24
Damage to Property	12	25

Table 1 shows the data on total road accidents that happened at Megadike West Road, Santa Rita, Pampanga, between the years 2021 and 2022. These data were acquired from the Philippine National Police in Santa Rita, Pampanga. In the year 2021, there were no road accidents that resulted in homicide. However, there were twelve road accidents resulting in physical injury and damage to property. Moreover, in the year 2022, the number of road accidents that resulted in homicides was six, which is higher than in the year 2021. Additionally, the number of road accidents resulting in physical injury doubled compared to the previous year. Lastly, the number of road accidents that

resulted in damage to property was 25, which is also higher compared to the year 2021.

Table.2. Solar Street Lights Design Layout Plan Placement Requirements

Road Classification	Lighting Arrangement	Road Width	Pole Placing (m)	Mounting Height (m)	Lamp Wattage (LED)	Mast Arm Length (m)
Secondary	Single	6.7	15-35	10	80-125	1.5

The road specifications of Megadike West Road, Santa Rita, Pampanga, have a road length of 7,600 meters and a road width of 6.1 meters. The placement of the solar street lights was dependent on the design that the researchers gathered from the Department of Public Works and Highways. According to the guidelines that were collected by the Department of Public Works and Highways, these are the data used in designing the solar street lights.

Table 2 shows the appropriate roadway lighting stationing and parameters needed for the design and placement of solar street lights at Megadike West Road, Santa Rita, Pampanga. The road width of the Megadike West Road is 6.1 meters, which falls under the secondary road classification. Furthermore, under this classification, the lighting arrangement to be used should be a single arrangement. The placement of the pole should have a minimum distance of 15 meters and a maximum distance of 35 meters. The mounting height of the street light should be 10 meters. The lamp's wattage should be between 80 and 125 watts. The mast arm should have a length of 1.5 meters.

Table.3. Pole Height

Roadway Classification	2 Lanes One Side
COLLECTOR SECONDARY	10(33')

Table 3 shows the needed pole height for the design of a solar street light. The Megadike West Road is considered a collector secondary roadway classification given the road has two lanes; thus, the pole height must be at least 10 meters, or thirty-three

feet. Further, the placement of the lamp on the pole should be on one side only.

2.1 Output Development

The proposed installation of the solar street lights at Megadike West Road, Santa Rita, Pampanga, was based on the design output that the researchers produced. The researchers used AutoCAD software to establish these designs, which depict the general placement and layout plan for the solar street lights based on information and recommendation guidelines supplied by the Department of Public Works and Highways. The design placement and layout plan of the solar streetlights took 254 solar street lights. Street lights were spaced 30 meters apart, and their arrangement was single-sided, placed on the left side of the road if you were going to Porac, Pampanga. As for the details of the street light itself, the length of the pole that will be used is 12 meters, while the mounting height of the street light will be 10 meters. The dimensions of each street light footing are 1.5m x 1.5m x 0.3m in thickness.

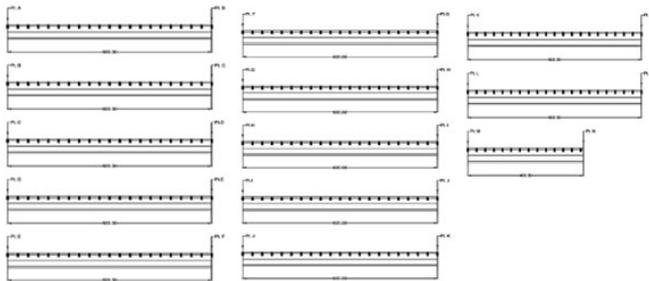


Fig.1. Straight Line Diagram of Megadike West Road, Santa Rita, Pampanga

IV. CONCLUSION

Based on the data gathered, road-related accidents occur at Megadike West Road, Santa Rita, Pampanga. Through the gathered data from the Santa Rita, Pampanga Police Station, the researchers found out that the problem that they want to address in the transportation system of Megadike West Road, Santa Rita, Pampanga, often occurs during the night. Moreover, existing studies prove that the lack of road illumination causes road accidents. These concluded that there is a need for the installation of street lights on the aforementioned road.

Through the guidelines and standards for installing street lights and supporting details of existing studies, the researchers were able to make and accomplish the proposal for the design of a solar street light installation layout plan. The proposed layout plan produced is reliable because it was based on the installation guidelines given by the Department of Public Works and Highways. Moreover, the proposed layout plan was designed as an economical, suitable, efficient, and safe plan for the people and community. Additionally, environmental protection was taken into account.

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