From Ground Up: Addressing Water Shortage in Sitio Sapang Bayu, San Isidro, San Luis, Pampanga Through a Proposed Solar-Powered Water Pump Design

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Abstract: - Global water crisis is a prevailing situation with multiple possible solutions through the use of concepts in Engineering. Renewable energy is likewise becoming the future primary source of power production and supply. In line with the aforementioned, the study focused on proposing a design in the water utility sector and identifying issues and difficulties involving water usage experienced within smaller communities that are located far beyond municipal centers and highly developed areas. The researchers identified issues involving water availability and efficiency and the probability and economical aspect of usage of renewable energy in the water supply on a smaller scale. The solar-powered water pump system is proposed as an alternative for water production and distribution to residential areas within remote and isolated communities for domestic use. The proposed design primarily consists of monocrystalline solar panels and a battery storage unit to power the jetmatic pump in order to fill the water tanks. A battery unit serves as a backup which allows a continuous flow of water to residential units round the clock, night and day. The researchers found out that remote areas suffer shortages and weak flow of water as a result of their location. Water is essential to everyday needs, as such, it provides more productivity in order to perform daily activities. Securing the availability of an efficient, cost-effective, and environment-friendly water pump system ensures a wide range of solutions to problems encountered by water scarcity. The proposed design is self-sufficient as it is powered by solar energy and support units in the presence of a battery and allows continuous operation.

Key Words: — *Water, Water Scarcity, Water Pump, Solar Panel.*

I. Introduction

Water is a fundamental necessity for the effective and efficient functioning of all living things on Earth. As for humans, water is a vital need.

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As each individual's body is composed of 60-70 % of water, it has many functions which help the body maintain its good shape. Examples of these purposes are protecting the organs and tissues, lubricating joints, as well as conveying nutrients and oxygen to cells. It is therefore important to replenish water in the body by consuming sufficient amounts of liquid. Water is also essential for everyday tasks. May it be doing the laundry, washing the dishes, taking a bath, cleaning things, and irrigating the plants or crops, water remains to be of great importance. However, as the years go by, because of problems such as climate change, access to water is not enough and the water supply becomes insufficient for all the people around the world.

As water scarcity emerges in Asia, the Philippines is not excluded from this situation. Palanca-Tan (2020) stated that harmful, weak, and unsustainable water sources cause nine million Filipinos out of 101 million to suffer. According to Ignacio et al. (2019), out of 1489 municipalities in the Philippines, 331 are included in the list of waterless communities. Six million people in the Philippines currently lack access to appropriate water, and since March 2019, thousands of houses in Metro Manila have had inconsistent or no water service. This phenomenon mostly happens within remote areas as these are often secluded and away from civilization. In this study, the researchers chose to look into the situation in one of the communities here in Pampanga regarding the state of their water supply. Based on the statement of the people living in Sitio Sapang Bayu, San Isidro, San Luis, Pampanga, they experience limited to no water access in their area. Because of this, it takes time for them just to fill a water bucket and even more time to collect water that they will use for the whole day. Other water source is also not available, resulting in them relying only on the insufficient water supply in their area.

As the world population continues to rapidly increase, the availability of resources for humans has become a critical concern. This is especially true for water, as it is essential for life and a basic human need. Unfortunately, the water demand far outweighs its availability, resulting in global water shortages and further scarcity of this invaluable resource. The economic and environmental causes and impacts of these shortages can have devastating consequences on communities, with effects ranging from food insecurity to reduced recreational opportunities to ecological destruction.

Numerous issues, including water pollution, climate change, inadequate water management, and rising demand, have contributed to the increase in water scarcity. Recurring and extreme heat waves aggravate drought conditions and add to water shortages because they hasten the evaporation of soil moisture. Extreme weather occurrences are making water scarcer. Groundwater in aquifers, which provides 36% of the world's domestic water supply for close to 2 billion people, is particularly vulnerable to future climate change, according to the 2018 Intergovernmental Panel on Climate Change assessment. They also concluded that wet areas would become more humid and dry areas would get drier (Lai, 2022).

One of the most fundamental human rights is the ability to access clean water, yet water scarcity affects billions of people worldwide. However, through creative innovation, technologies can produce fresh water that can be used on a daily basis. Many new technologies have emerged in recent years to deliver water to communities that are in most need of it.

According to Jones (2020), the WaterSeer and the Desolenator are some of the technologies that solve water scarcity around the world. The WaterSeer is a technology that aims to extract moisture from the air without using electricity or expensive chemicals. The key to providing a sustainable source of clean water in this process is in the form of condensation. The Desolenator, on the other hand, is a mobile solar-powered desalination system that exchanges heat using solar energy to create clean water. The primary selling feature is that it has no moving components or filters and simply needs sunshine.

In the Philippines, mostly in remote areas, water scarcity is the main problem that communities are still experiencing. This results in the development of devices that can minimize water scarcity. The Philippine Water Challenge (2022) and the Low-Cost Digitization and Automation Solution, which uses an electronic device to monitor both water volume and water pressure, were arranged by the United States Agency for International Development. This solution was created by the winning organization, the Libmanan Water District of Camarines Sur, to assist water utilities in understanding their operations in real time through automated data collection and transfer to their central system.

One of the main ways to produce water is by water pumping. This is utilized in many different sectors of life, including agriculture, industry, and domestic consumption. The fast-changing, technologically driven world creates an easier methodology that will enhance water production through the introduction of high-end technologies. Water pumps are generally diesel-powered machinery used by those without or with limited access to irrigation canals, and therefore use groundwater to saturate crops.

The proposed design in this study has been formulated through the increasing push for a shift to renewable energy use. It is also in line with the extensive rise of fuel prices brought by geopolitical issues and natural resource depletion. According to Deyi Zhou and Abdullah (2016), due to the expensive fuel and unstable electrical markets, the solar water pump is a preferable option to conventional water pumps. The system harnesses solar energy. It is also the most efficient for water pumping from groundwater resources. A solar power system is more economical compared to diesel- and other gas-powered generators in terms of operation and maintenance.

Water scarcity is a serious problem in Githurai Ward (Ngima, 2015). The paper of Seckler, Molden, and Barker (1999), as cited by Diansyukma (2021), relied on the research of 118 nations' water supply and demand predictions from 1990 to 2025. The nature and geographic locations where water scarcity is increasing showed that a quarter of the world's population, or one-third of the population in developing countries, lived in weather-prone locations. In the first quarter of the twenty-first century, water scarcity is projected.

Additionally, from Mekonnen and Hoekstra (2016), two-thirds of the world's population, or four billion people, reside in regions with severe water shortages for at least one month in a year, whereas, about half of those people reside in China and India. Extreme water scarcity affects half a billion people worldwide year-round. Reducing the threat presented by water shortage on biodiversity and human welfare will require increasing water use efficiency, limiting water consumption by river basin, and better sharing of the few freshwater resources.

Data shows that, notably in Asia, increasing the usage of treated wastewater and desalination can dramatically lower the levels of water scarcity and the number of impacted individuals. One must, however, consider all relevant circumstances. The findings could be subjected to more comprehensive evaluations that account for the technological and budgetary constraints on expanding desalination and the reutilization of treated wastewater globally (Van Vliet et al. (2021).

The study of Lee et al. (2020) explored through a qualitative investigation, the interdisciplinary characteristics that define Metro Manila's regional development. Studies in the future should not only examine Metro Manila's water security by focusing on its infrastructure, environmental circumstances, and social conditions but also consider assessing the overall outcome of regional development occurrence in the Philippines. To prevent conception, it is also necessary to comprehend how this study can be reproduced in other parts of the Philippines or in other nations.

There was research which focused on how El Niño is aggravated by climate change and the threat it brings to the water security of emerging cities. Other factors which influence Metro Manila's water supply security are included as well. To more thoroughly evaluate the numerous aspects that played a part in the present water shortage matter, Metro Manila's comprehensive water management policy is being evaluated following the finding of the connection between climate change and El Niño (Lee et al., 2020). According to Boretti and Rosa (2019), this is due to rapid population and economic expansion, which escalates the water demand, reduces the available water supplies, and expands water pollution.

Solar energy is a practical and environmentally friendly alternative for water pumping. It is inexpensive and may give reliable service for decades. Photovoltaic water pumping provides various advantages, including ease of use, reliability, and low cost (Zhou and Abdullah, 2016). It is also mentioned that solar energy is an option for many agricultural needs. Modern, well-designed, low-maintenance solar systems can offer electricity where and when it is needed. These are systems that have been tested and proven to be cost-effective and reliable around the world, and they are already increasing agricultural productivity globally. The results of the case study of Imjai et al. (2020), indicated that compared to a system without tracking, the actual cost of electricity provided by SWSS using solar photovoltaic systems that are upgraded yields greater performance.

To assess the integration of photovoltaic (PV) solar energy into the needs for groundwater pumping, this research suggests a multidimensional classification. To provide a comprehensive scenario where the significant influence of numerous parameters such as water needs, irrigation obtaining area, or aquifer depth is taken into consideration, alternative solutions are compared under economic, energy, and environmental aspects (Rubio et al., 2019).

1.1 Statement of The Problem

Water scarcity developed into a global crisis wherein individuals in remote locations, in particular, experienced scarcity, health issues, and discomfort in their way of life. Sitio Sapang Bayu, San Isidro, San Luis, Pampanga, is experiencing a shortage in their water supply, causing them adversity in their everyday tasks where water is required. This led the researchers to come up with a Proposed Solar-Powered Water Pump Design that may help provide the people in the area with a sufficient water supply that will then be distributed to their respective households using pipelines.

1.2 Objective of The Study

The objective of the study is to improve access to clean water and deal with the growing demand for water consumption by developing a design that is environmentally-friendly and economical. The researchers proved the efficiency and cost-effectiveness of the renewable energy system in power production and its application to water distribution for domestic purposes.

1.3 Significance of The Study

The study would be important to the community, local government units, the engineering industry, the environment, and future researchers. Moreover, the proposed design of the study is important for the water condition around Sitio Sapang Bayu, San Isidro, San Luis, Pampanga.

1.4 Scope and Limitations

This study aimed to introduce an alternative water pump system that solves the woes of water inaccessibility to households, specifically experienced by remote-lying areas. The proposed design focused on secluded and far-flung areas in the Philippines which experience problems related to water utilities and water production. The locale chosen is at Sitio Sapang Bayu, San Isidro, San Luis, Pampanga. This study focused on the use of renewable energy systems in water production and distribution, specifically the use of solar-powered energy systems, that is distributed through water pipeline system. The water produced is primarily used for household or domestic purposes that are potable through the help of a built-in water filtration system.

The study proposed a solar-powered water pump design only, excluding the formulation of a prototype. It covers relatively smaller communities or villages. The locale consists of a maximum of 18 households with an average of five members each or equivalent to 100 individuals or less. It is equivalent to an estimated volume of water consumption of 90.09 liters (minimum of 100 liters) per household member which equates to a minimum of 9,000 liters of water production per day in a single community. The study does not cover high mountainous areas due to higher elevation which makes it less economical as it requires more sophisticated materials to pump water. The proposed design is primarily suggested for public use thru government-led funding.

1.5 Conceptual Framework

Figure 1 shows the process how the study was conducted. The questionnaires determined the suitability of the study to the locale as the surveys and interviews identified the presence of the problem of water inaccessibility in the area. The researchers focused on Sitio Sapang Bayu, San Isidro, San Luis, Pampanga. The surveys and data gathered were essential in establishing the technical specifications of the proposed design. It determines the number of households including their volume of water consumed and water bills and identifies the ideal volumetric consumption of the whole population. The volume calculated served as the basis to find the best type of materials that were used in selecting the size of water tanks, the capacity of jetmatic pumps, solar panels, and battery storage unit.

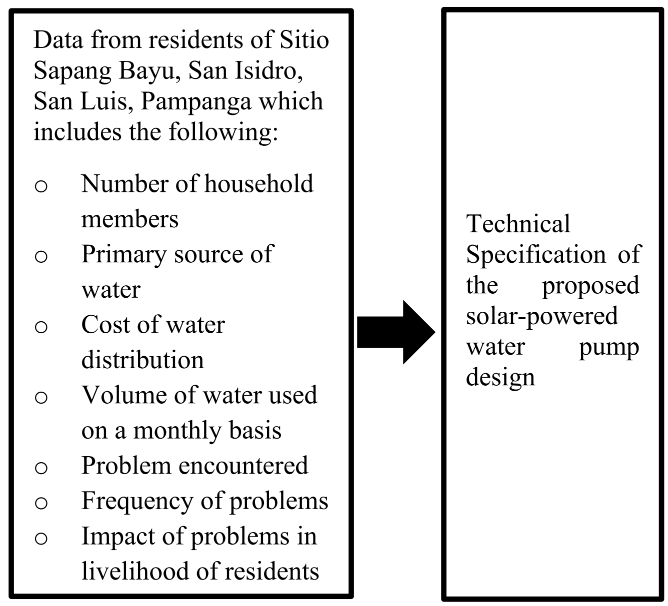

Fig.1. Paradigm showing the relationships among the data and the design.

II. Methodology

2.1 Research Design

The study employed a mixed method technique which was both quantitative and qualitative aspects. These are the chosen approaches to obtain statistical data with the technical and technological feasibility of the design with a combination of the perspectives of the target locale. The data collection procedure uses secondary research methodology to enhance the existing design to enhance its applicability and feasibility in other areas such as the residential sector. Observations and interviews are vital to obtain textual data in essence to support the data that pertains to issues arising from water scarcity and accessibility difficulties experienced by the target population.

2.2 Research Instrument

For the data-gathering part of the study, the researchers utilized a two-part research instrument. The first part looked into the quantitative data needed to complete the study. This is composed of five questions and its main purpose was to make the residents identify all the components on the questionnaire which can affect the design of the project. The second part of the research instrument looked into the qualitative part of the study. This part consists of three questions that discovered the difficulties that the residents encounter in terms of their water supply. The questionnaire and questions for the interview were explained to the respondents in a familiar language. Translation to Filipino was done as needed.

2.3 Participants and Sampling Technique

A total population sampling was used for selecting the participants in this study. The researchers chose to examine the entire population. A total of 18 households are in the selected area, Sitio Sapang Bayu, San Isidro, San Luis, Pampanga, given this, 18 respondents were chosen to take part in the study wherein each of them represents their household.

2.4 Research Locale

The study was conducted in Sitio Sapang Bayu, San Isidro, San Luis, Pampanga (*see Figure 2*) with the locals participating in collecting information concerning the water shortage in the area. The respondents were asked about their daily access to water. Furthermore, the researchers chose the location of the study because it provided the researchers with the necessary information about water scarcity first from the residents of the area.

Fig.2. Sitio Sapang Bayu, San Isidro, San Luis, Pampanga

2.5 Data Gathering Procedure

The data were gathered utilizing interviews and surveys. With their consent, selected people from the community were asked to answer the research instrument provided and ask questions verbally as part of the interview about the condition of their water supply and their estimated water consumption per day. The gathered response was prepared for the analysis of data. Data saturation was likewise observed and applied. As per Braun and Clarke (2016), it has previously been proposed that qualitative studies require a minimum sample size of at least 12 to achieve data saturation.

2.6 Data Analysis

The data gathered in survey questionnaires were prepared and organized. Furthermore, the accumulated data were carefully analyzed to get the power requirement of the design, which will also serve as the basis of analysis that was used for the proposed design of the project. Afterward, through the analyzed response of the participants, the researchers were able to calculate the wattage of solar panels, the capacity of the water tank, the horsepower of the jet pump, and the batteries.

On the other hand, in analyzing the data for the interview questions, the researchers applied Creswell's Qualitative Content Analysis Process. According to Creswell (2012), as referenced by Putri and Hardi (2019), qualitative research is an approach for examining and collecting the importance that individuals or groups set on a social human condition.

2.7 Flow and Design of The Project

The design primarily involves a water pump system powered by solar energy. It involves a single building facility, which houses water tanks and a water pump system together with a water filtration system, solar panels installed at its roofing, and a storage space for the battery unit. The system pumps through an underground water source through the use of a jetmatic pump, which is then processed for purification via a water filter system before being transported and distributed to residential units via a water pipeline system. The volumetric capacity depends on the number of households in relation to average daily water consumption. The solar panels serve as the primary source of electricity to power the jetmatic water pump. The power capacity is calculated in relation to the required water volume supply demand of the community and the specification of the pumping system such as water flow capacity. The battery storage unit serves as a backup or reserve of power in order to allow continuity of operation at nighttime. The water is distributed from the pumping facility to residential units via water pipelines: the mainline has a diameter of six to twelve inches, and the diameter for branch lines from the mainline to the household unit is three-fourths to one inch. Figure 3 summarizes the process on how the designed project will operate through a pictorial diagram.

The researchers' objective is to introduce an alternative proposed design that entails a new water production and distribution system that provides an alternative mode other than the existing and traditional procedure. The data gathered through the survey, specifically the volumetric consumption, is used to determine the necessity of the design and its applicability to a certain locale. The data obtained is used to identify the ideal specification of the technical aspect of the project, including the size and capacity of a water tank, the capacity of the solar panel, and the battery.

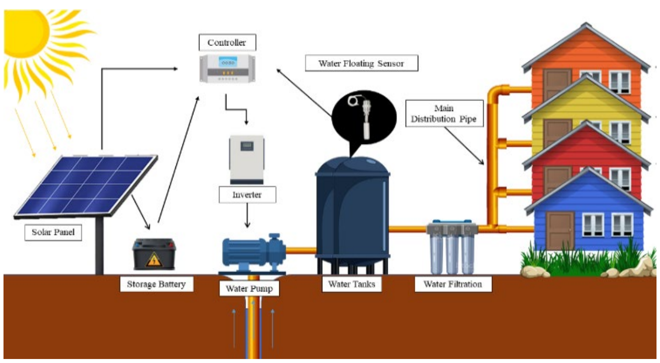

Fig.3. Pictorial diagram of the proposed design

III. Results and Discussion

3.1 Survey Questionnaire

3.1.1 Frequency and Percentage Distribution of the Respondents according to how many people reside in their houses

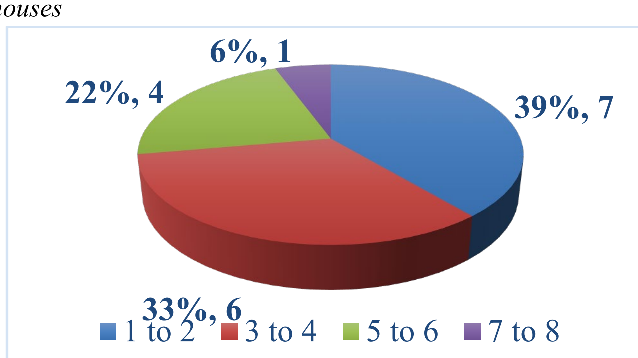

Fig.4. How many people reside in their houses?

Figure 4 shows how many people reside in the house together with the respondents. It has been shown that the majority of the responses indicated that 1 or 2 people reside in their house which was represented by 7 respondents or 39%, followed by 3 to 4 people with 6 respondents or 33 %, succeeded by 5 to 6 people with 4 respondents or 22 %, and lastly, 7-8 people with 1 respondent or 6%.

3.1.2 Frequency and Percentage Distribution of the Respondents according to primary source of water in their household

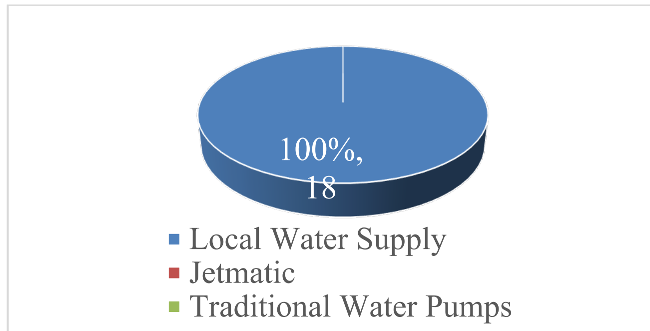

Fig.5. What is the primary source of water in their household?

For the figure 5, among all the three possible choices for the primary source of water supply, all 18 respondents, or 100%, answered local water supply.

3.1.3 Frequency and Percentage Distribution of the Respondents according to where they typically use water for household or residential use

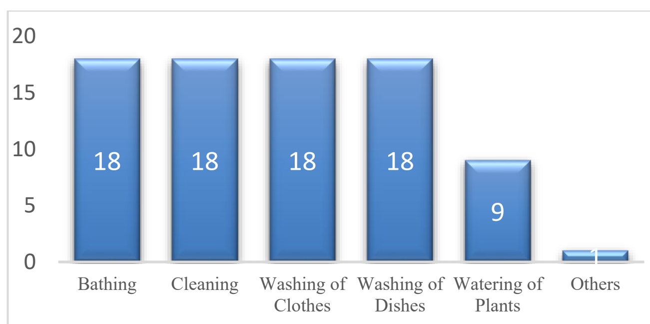

Fig.6. Where do they typically use water for household or residential use?

The result of the survey of where people typically use water for household or residential use was presented in figure 6. Out of 18 people, 100% of them answered that the use of water is for bathing, cleaning, washing clothes, and washing dishes.

Meanwhile, 50% of the respondents answered that they also use it for watering plants, and some of them use it also for other (6%) purposes.

3.1.4 Frequency and Percentage Distribution of the Respondents according to how frequent they and other members of their household take a bath in a day

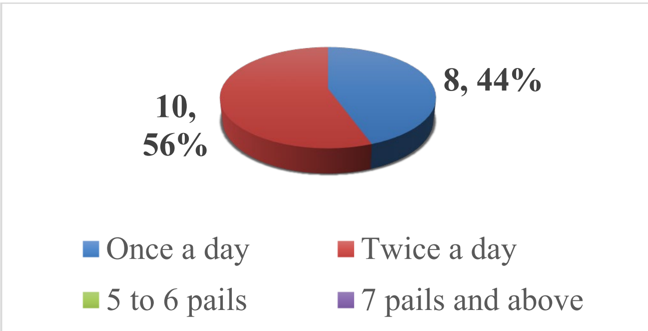

Fig.7. How frequent do they and other members of their household take a bath in a day?

Figure 7 presented that the majority of the respondents answered twice a day with 10 respondents or 56%, followed by a response of once a day with 8 respondents or 44 %.

3.1.5 Frequency and Percentage Distribution of the Respondents according to average of how many pails of water can be consumed for bathing per person

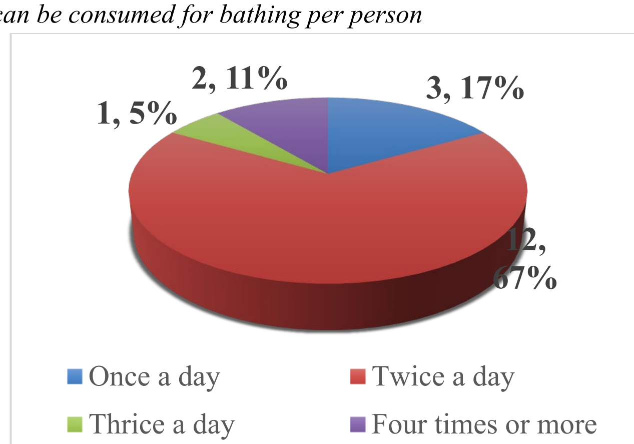

Fig.8. How many pails of water can each person consume from taking a bath?

For the figure 8, the greatest number of respondents falls on 3 to 4 pails with 12 respondents or 67%, followed by 1 to 2 pails with 3 respondents or 17%, then 2 respondents or 11% for 7 pails and above, and to complete the total of 18 respondents, 1 respondent or 5% for 5 to 6 pails.

3.1.6 Frequency and Percentage Distribution of the Respondents according to average water bill cost

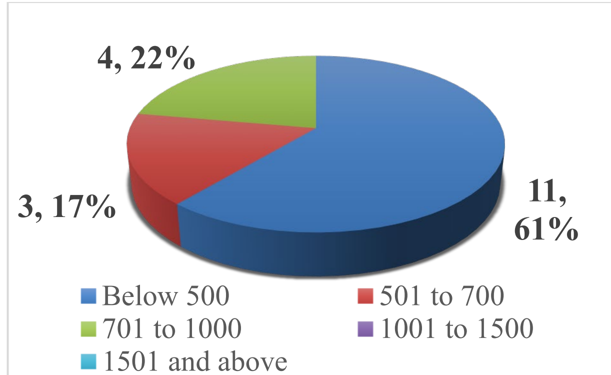

Fig.9. Average Bill Cost

Figure 9 shows that out of 18 respondents, 11 or 61% of them answered that they consume an average of 500 pesos and below on their monthly water bill. While 3 or 17% of them responded that their water bill is in the range of 501 to 700 pesos. The remaining 4 or 22% of the respondents claimed that it is in the range of 701 to 1500 pesos a month**.**

3.1.7 Frequency and Percentage Distribution of the Respondents According to volume of Water

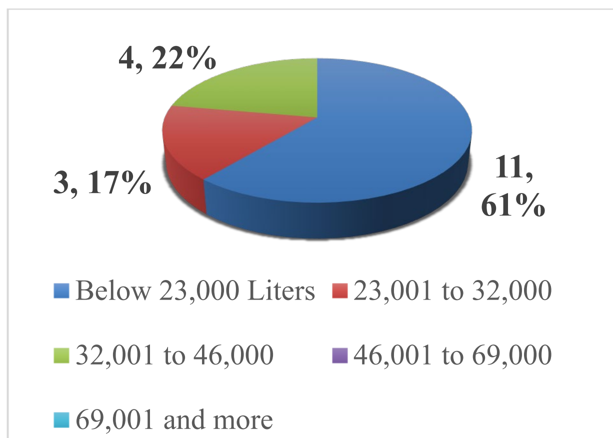

Fig.10. The volume of Water per Month

Figure 10 displays that 11 or 61% out of 18 respondents answered that they consume water 23000 liters and below in a month. 3 or 17% of them responded that they consume an average of 23001 to 32000 liters of water. While the remaining 4 or 22% of them said that they consume water in the range of 32001 to 46000 liters.

3.2 Interview Question

3.2.1 What water distribution and other related issues have you encountered?

One of the concerns that respondents reported was the weak water pressure. It was described as a level below the regulatory reference, or the minimum pressure administered when the system demand is standard. When there is weak water pressure, the water that emerges from taps or shower heads gently drips out instead of spraying out at the usual pace and volume. The standard of living in a home can be greatly impacted by weak water pressure. When water pressure is reduced, anything from taking a shower to washing the dishes, to doing laundry, and more can take longer and be more frustrating.

Water is necessary for human, plant, and animal life. Since the earliest days of humanity, people have lived near water sources. Unfortunately, water is in inadequate supply in many countries. An improved water supply can help people live better lives and is both a prerequisite for and a source of socioeconomic growth. People in Sitio Sapang bayu, San Isidro, San Luis, Pampanga experienced hard water supply.

3.2.2 How frequent does the problem occur?

The researchers identified the first theme in which the problem of water supply occurs almost every day. The respondent's statement directly implies an everyday loss of water supply. Moreover, some responses boil down to the problem recurring for a week.

Water is vital in everyday lives, for it depicts life. Aside from the shortage of water supply, another theme highlighted for this question was their experience of having no water supply for an entire day.

3.2.3 How does these problems impact your livelihood?

The first theme indicated in the third interview question was their struggle on taking a bath. Taking a bath is one of the basic daily routines of people. Most people choose to take a bath before going somewhere, either going to school, work, or to any schedule that they have. It can be for the reason that they want to freshen up, boost their energy, or lighten up their mood. However, for the residents of the locale, taking a bath in the morning is a struggle because of their existing problems regarding their water supply.

Moreover, it also observed that people need to stock water at night. In this kind of circumstance wherein there is weak to no water access to water, having to stock water is very essential in order to prepare for use for the next day.

Another impact of weak water supply that they are experiencing especially in the morning is that people cannot do their usual household chores at this time of the day. As a result, the respondents decide to just delay doing their household tasks for later.

As regard the result of the survey, respondents firmly agree that a lack of access to water has a significant impact on their life because considering having already numerous expenses, water will be an additional expense for those who do not have access to it.

IV. Findings

A survey was conducted for this research to determine the volumetric water consumption that was used for the design of the project. According to the obtained data, 100% of the households in the community use water from a local distributor as a primary source of water. The members of each household use the water for bathing, cleaning, and washing clothes and dishes which accumulates to 100% of the total respondents. They often use it for bathing, as the average indicate that the members of the family take twice a day in taking their bath, which roughly equates to three to four bucket of water per bath, where one bucket is equivalent to fifteen liters. On average, each household consumes ₱500 in water bill monthly, which is equivalent to less than 23000 liters of water consumed on a monthly basis.

Interview questions were also conducted to the people in the community regarding their experiences with their water supply. Based on the respondents, weak water pressure and hard water supply are one of the most frequent problems that they encountered in their community which happens almost every day and there are times when it happens for the entire day. These problems impact their everyday tasks such as taking a bath, doing their laundry, washing their dishes, and almost all their housework which requires the use of water. The respondents' answers just show their difficulty in regards to the water supply in their area. Thru these findings, it just shows how Sitio Sapang Bayu, San Isidro, San Luis, Pampanga is currently experiencing water scarcity.

V. Actual Proposed Design

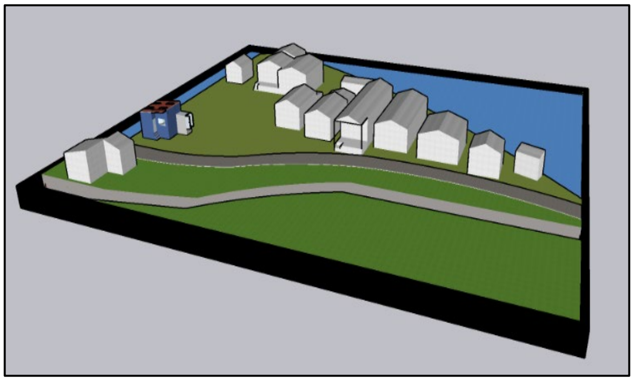

Fig.11. Isometric View of the Locale with the Proposed Design of the Project

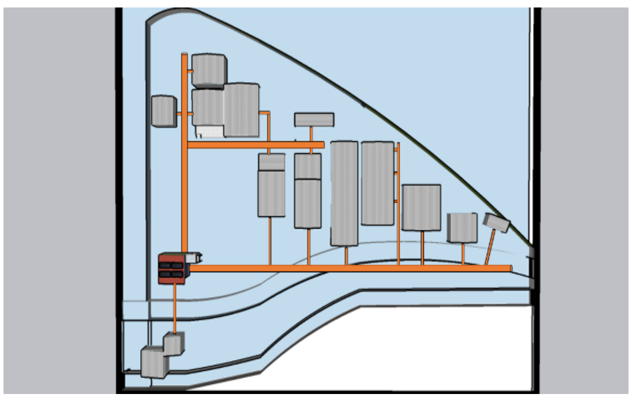

Fig.12. Top View of the Locale with Pipelines

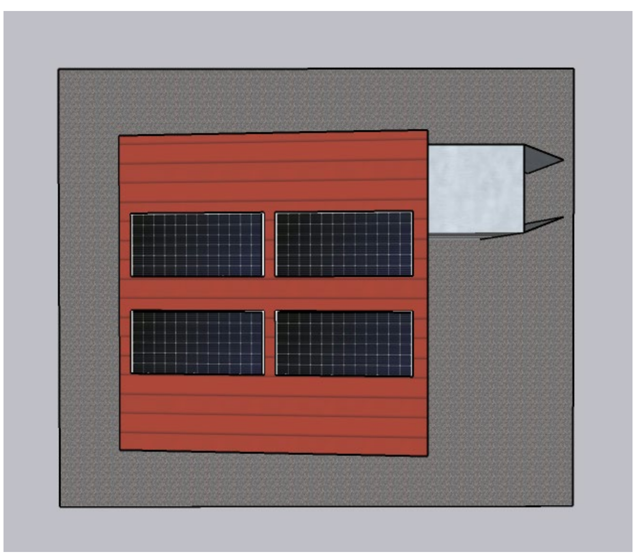

Fig.13. Top View of the Proposed Design

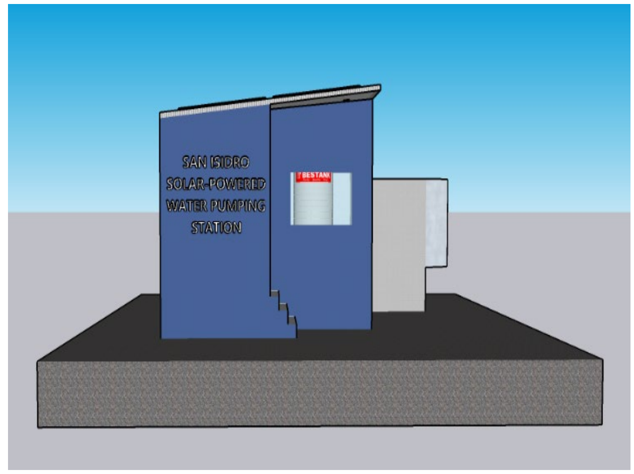

Fig.14. Front View of the Proposed Design

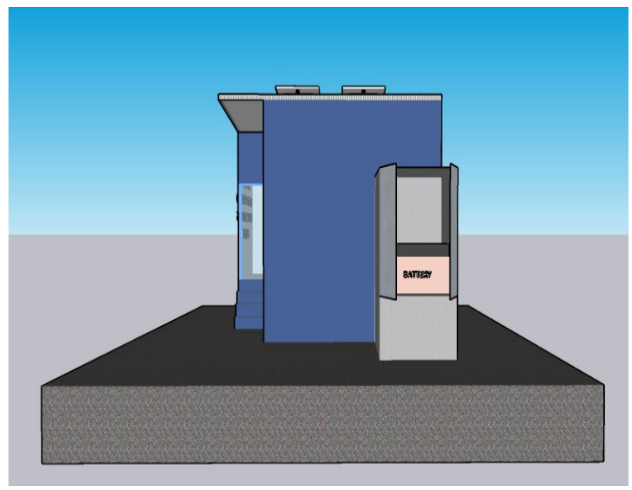

Fig.15. Right Side View of the Proposed Design

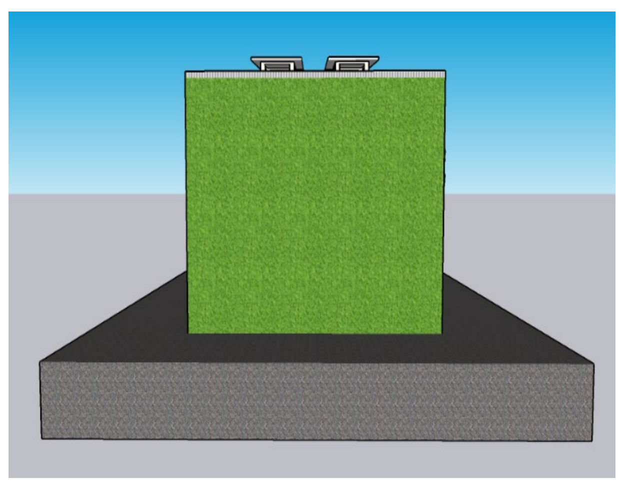

Fig.16. Left Side View of the Proposed Design

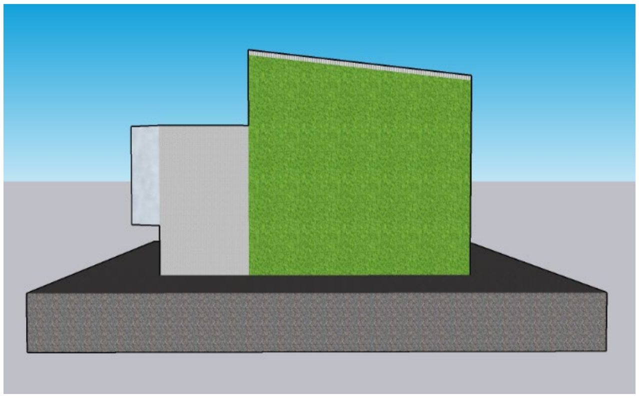

Fig.17. Rear View of the Proposed Design

VI. Conclusion

Based on the previously mentioned findings, the following conclusions were drawn:

Water plays a very important role in the everyday lives of people around the world. In particular, it has a significant impact on health and sanitation. The development of a solar-powered water pump design will enhance distribution aspect of water in terms of efficiency of uninterrupted and smooth flow of water in the area. The use of renewable energy such as solar energy will also give assurance of enough power and electricity for the continuous operation of the water pump facility.

An average of 23,000 liters of water per month per household consumption was surveyed in the locale of the study. The hourly water use per liter was multiplied by the 18 houses in the study area to obtain the overall result. A minimum of two water tanks, each containing around 340 liters of water, was used for the proposed study. Additionally, the amount of water was divided between the two tanks. The bare minimal power needed to transport water is known as water horsepower. One horsepower is needed to pump water in the proposed study to lift a source of groundwater that is 119 feet below the surface. A 1-inch diameter pipe can create 66 liters per minute for the time of loading the two tanks. Moreover, the solar panel capacity was determined by the power output of the pump to fill the two-340-liter water tank. For the actual power consumption, 1 Kilowatt per Hour is assumed as the daily requirement and 5 hours is the ideal maximum harness of solar energy. The capacity of the battery is determined using Electric power formula.

Despite having a local water distributor, securing the efficiency of having an adequate supply of water is not delivered. Based from the interview statements of the respondents on the chosen locale, they frequently experience water shortage and inefficient or weak flow of water. The locale is a remote area which constitutes to weaker to no flow of water as longer distances require higher pressures in order to deliver water to farther areas. Weak water flow or no water at all constitutes to difficulty of the community to perform daily household works such as taking a bath and cleaning.

Water scarcity, when prevalent, can be fatal and dangerous to human life. In remote areas far from civilization, assurance of the availability of water is questionable. The chosen locale, Sitio Sapang Bayu, San Isidro, San Luis, Pampanga, was assessed to have water scarcity. With thorough computation from different components of the design itself, validation from professionals, and various design considerations, the solar-powered water pump design proved to be a working proposal for the water supply at the locale.

When utilized accordingly, the proposed design could be used so that the people in the locale could experience better water availability. Adequate water supply in any community leads to better sanitation and promotes better health conditions. The proposed solar power pump design is also seen to be economical since it utilizes renewable energy which in turn lower distribution cost making water accessible and affordable. This could lead the people in the locale towards a better experience in terms of water accessibility and the benefits of having enough water supply for everyday use.

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